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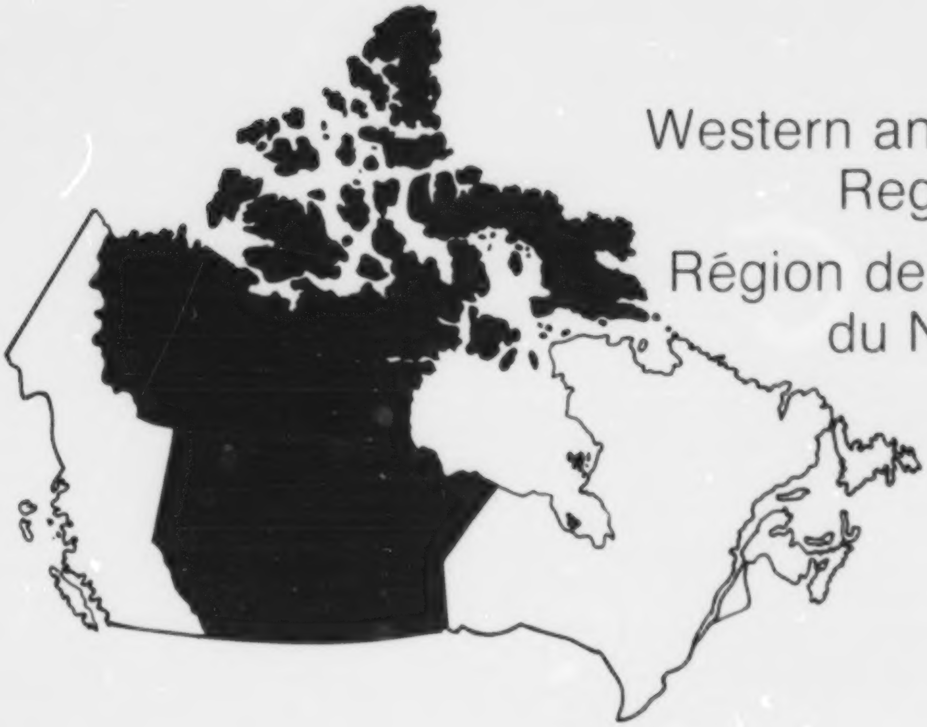

Western and Northern Region
Région de l'Ouest et du Nord

Environmental
Protection

Protection
de l'environnement

Canada

Proceedings
to:

Industrial Waste
Reduction Seminar

October 25, 1990
Winnipeg, Manitoba

PROCEEDINGS

TO

INDUSTRIAL WASTE REDUCTION SEMINAR

OCTOBER 25, 1990

FRONTIER ROOM
HOLIDAY INN SOUTH
WINNIPEG, MANITOBA

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AGENDA

INDUSTRIAL WASTE REDUCTION SEMINAR
October 25, 1990

Location: Frontier Room, Holiday Inn South, Winnipeg, Manitoba

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8:30	**Introduction & Welcome** Roy Nixon, Chief, Waste Management and Environmental Emergencies, Environmental Protection
8:45	**An Overview of the Waste Minimization Process, with Emphasis on the Waste Audit Process** Adolf Andres, Project Engineer, Environmental Protection
9:45	**Sampling for Audit;** **Opportunities for Source Based Management** Ross Edmunds, Manitoba Hazardous Waste Management Corp.
10:30	Coffee
10:45	**WHMIS and Waste Reduction** Marjorie Schell, Tomark Compliance Centre
11:15	**Government Tools to Promote and Achieve Waste Reduction** Roy Nixon, Environmental Protection
11:45	Lunch
12:45	**Video "Waste Not - Reducing Hazardous Waste"**
1:30	**Waste Reduction - The Provincial Perspective** D. Thompson, Manitoba Environment
2:00	**Non-Hazardous High Performance Painting Systems** Wayne Senick, Rode Management Systems Inc.
2:30	Coffee
2:45	**Video "Money Down the Drain"** Ontario Waste Management Corporation
3:10	**Techniques for Waste Reduction at Source** Roy Nixon, Environmental Protection
4:00	Close

INTRODUCTION
WHY WASTE REDUCTION?

BY

R. NIXON

ENVIRONMENTAL PROTECTION

OCTOBER 25, 1990

SECOND WASTE MINIMIZATION SEMINAR

Winnipeg, October 25, 1990

Roy Nixon

INTRODUCTION

"WHY WASTE REDUCTION"

The answer to our hazardous waste problems lies in waste minimization or reduction. Not in waste disposal. Don't produce the waste in the first place, then you don't have to dispose of it.

Not only do you avoid the trouble and considerable expense involved in disposing of a hazardous waste properly, BUT you also save money by savings in raw materials, water usage, more and better products, better employee morale, lower insurance rates, and have less trouble meeting government regulations.

Small generators of hazardous waste, for example, metal plating shops, dry cleaners, small foundries, etc., have difficulty finding technical help toward solving their waste problems. The big companies can afford to employ permanent staff to do this, or to hire consultants. The small operations usually cannot afford it.

This seminar is one small part of an Environment Canada program designed to overcome this dilemma.

We do not pretend that we can tell you exactly what you should do in your own particular shop or plant, but I think that we can give you some idea of how to go about tackling waste reduction. What questions to ask. Where to get some help. And above all we hope to convince you before we leave here this afternoon that it makes good economic sense to reduce waste. It will keep you out of trouble with the regulators, and it can often be achieved with a minimal capital expenditure.

Two examples of what I mean by economic sense:

In the early 80's the U.S. EPA did a waste survey of the metal finishing industry. Several thousand shops and plants of all sizes. This survey showed that, on average, 70% of the metals purchased for plating onto bumpers, ornaments, tables legs, etc., WENT DOWN THE DRAIN OR OUT THE PLANT DOOR AS SLUDGE. 70%, it is hard to believe! That was money going down the drain. Literally. The second example is from my own experience. I once worked for a large petrochemical company. In those days prices were low and our return on sales was 5%, i.e. we had to sell $20 of chemicals to make a $1 profit. A $1 saved therefore had as much effect on profits as selling $20 worth of products. We found it much more profitable to use our technical manpower to reduce waste than to increase production by adding capital equipment or making extensive process changes.

To finish, and at the risk of exceeding my time allotment, I would like to present a summary of some of the benefits of, and obstacles to, waste minimization. These tables include nearly everything that you will be hearing today.

WASTE MINIMIZATION DELIVERS BENEFITS

ECONOMIC

- Reduced storage and handling cost
- Reduced waste transport, recycling and disposal costs
- Income from sale, reuse, or recycle of waste
- Reduced raw materials cost
- Increased production
- Lower insurance rates
- Lower health and safety cost
- Improved product quality

PUBLIC RELATIONS

Even without a proactive publicity program, word of your efforts will spread via your employees, stock holders and customers.

LIABILITY

Reducing waste will avoid potential short and long term liabilities associated with waste management, transport and disposal.

Your responsibility does not end when you ship wastes off your site, even to a licensed disposal facility.

COMPLIANCE WITH REGULATIONS

Regulations for the disposal of waste are getting tougher at all levels of government. Waste reduction will make it easier for you to meet these regulatory requirements.

WASTE MINIMIZATION APPROACHES AND TECHNIQUES

INVENTORY MANAGEMENT & IMPROVED OPERATIONS

- Inventory and trace all raw materials
- Purchase fewer toxic and more non-toxic materials
- Train your employees
- Improve material receiving, storage and handling practices

MODIFICATION OF EQUIPMENT

- Install equipment that produces least waste
- Modify equipment to enhance recovery or recycling
- Redesign equipment or production methods to produce less wastes
- Improve equipment operating efficiency
- Maintain a strict preventive maintenance program

PRODUCTION PROCESS CHANGES

- Substitute non-hazardous for hazardous raw materials
- Segregate wastes by type
- Eliminate sources of leaks and spills
- Separate hazardous from non-hazardous wastes
- Redesign or reformulate end products to be less hazardous
- Optimize reactions and raw materials use

RECYCLING AND REUSE

- Install closed loop systems
- Recycle on-site for reuse
- Recycle off-site for reuse
- Use waste exchanges

OBSTACLES TO WASTE MINIMIZATION

	Source Reduction	Off-Site Recycling	On-site Recycling
Economic Barriers			
Lack of capital	x	x	x
Financial liability		x	
Technical Barriers			
Attitudes to change	x	x	x
Batch processes			x
Lack of information	x	x	x
Technical limits of process	x	x	x
Technical quality concerns	x		
Regulatory Barriers			
Need to obtain permits or licenses	x	x	x
Perceived stigma of managing hazardous waste		x	x
May affect ability to meet other regulations	x	x	x

AN OVERVIEW OF THE WASTE MINIMIZATION PROCESS WITH EMPHASIS ON THE WASTE AUDIT PROCESS

BY

ADOLF ANDRES

CONSERVATION AND PROTECTION

ENVIRONMENT CANADA

OCTOBER 25, 1990

Even governments, which are usually quite conservative, are starting to realize that traditional methods of pollution control suffer from many limitations. Several years ago I tried to get a speaker to talk at the Canadian Waste Management Conference on industrial waste reduction. She couldn't come because she was recently hired by the City of Los Angeles to initiate a Waste Reduction Program.

Manitoba, through its newly proclaimed Waste Reduction and Prevention Act, expects to reduce wastes by 50% by the year 2000. The emphasis is presently more on consumer type wastes, but that is changing. Industrial waste reduction will be mandated more and more with time, and all of you might be affected.

The Canadian Council of Ministers of Environment has also concluded that 50% waste reduction by the year 2000 is a must in order to protect the environment. I expect that more pressure will also be placed on federal facilities to implement waste reduction programs.

By waste reduction, I mean, not generating the wastes in the first place. Other people talk about waste abatement, waste minimization, or pollution prevention. All of these terms are used more or less interchangeably. They signify a new way of thinking - considering all waste materials, including contaminants, as resources that have some intrinsic value. We need to think in terms of zero discharge of hazardous materials to the air, water, and land, and to try to come as close to this ideal as is practically possible. General Dynamics has implemented what it calls a "Zero Discharge" program precisely for this purpose.

The reason for going to this new way of thinking is not only to reduce pollution, to conserve resources, or because government mandates it, but also because there often is an economic benefit to the company. Dow Chemical's Waste Reduction Always Pays program reflects this fact. Capital costs expended on waste reduction can often be recovered within several years. A number of large companies have made and/or saved millions of dollars by taking this approach. The 3M Company headquartered in Minnesota is probably most often quoted for its waste reduction work. Case histories of many companies, both small and large, are highlighted in a number of reports and books, such as those listed in the bibliography.

The benefits that can result from waste reduction are due to

* reduced waste genetration and, therefore, reduced waste treatment and disposal costs;
* reduced raw material consumption;
* substitution of cheaper raw materials;
* sale of recovered materials;
* reduced probability of incuring civil and criminal liability due to mishandling of hazardous wastes;
* improved public immage;
* improved competitiveness;
* meeting future federal and provincial waste reduction requirements without incurring penalties; and last but not least
* environmental protection.

Methods of Waste Reduction

I will use the general term "waste reduction" for the sake of simplicity. I will also focus primarily on hazardous waste reduction since it is these types of waste which have the greatest impact on the environment. When I talk about waste reduction, I mean the implementation of specific changes such as:

* inventory control (ensuring that no new hazardous materials are purchased while the same materials are becoming outdated in another part of the facility. A good example is inventory control of non-rechargeable type batteries which contain hazardous materials);
* changing purchasing procedures. This could mean buying in smaller containers in order to minimize the generation of outdated chemicals which need to be disposed of (American Chemical Society, 1985), or in bulk or larger containers. It could also mean standardizing the type of hazardous material used for carrying out certain processes (e.g. solvent degreasing);
* changing policies that impede waste reduction (e.g. policies which specify use of pesticides for pest control instead of non-hazardous alternative);
* good housekeeping (prompt repair of leaks; proper equipment maintenance to minimize emissions; keep in-use solvent holding containers covered when not used; prevent contamination of oils, gasoline or other hazardous materials to allow for more ready re-use or recycle); For federal facilities, this may be the most applicable tech-

nique along with substitution.

* substitution of less hazardous materials (e.g. replace solvent based paints, inks, and adhesives with water based alternatives). This could include the purchase of feedstocks which contains fewer and lower concentrations of hazardous materials;
* improving operational procedures (e.g. in vapour degreassing, use the stop and go technique to minimize the amount of vapour that is pushed out of the degreaser; improved drum handling to reduce spills).
* keeping waste streams seperate to facilitate recovery and re-use, or recycling of materials;
* improving hazardous materials collection to facilitate re-use, or recycling (install drip trays at refueling stations);
* treatment of wastes to reduce volume, mass or toxicity (this may include composting and neutralization of acids but not other processes such as incineration which only transfers wastes from one medium to another. Pyrolisis could be considered as a waste reduction technique. Heat recovery incineration is marginal as a waste reduction technique);
* making process changes (e.g. use electrostatic instead of spray paint equipment; using sand or plastic beed blasting instead of solvents for paint stripping);
* product reformulation (this may not necessarily help the company to reduce its pollution load on the environment but it could help other companies or the end user). For

example: 1) reformulating a pesticide to remove so called "inert ingredients" which may be carcinogenic; 2) reformulating a paint pigment so as not to add a toxic chemical which would otherwise impact on paint formulators.

* modernization (e.g. installation of more efficient equipment, re-designing and rebuilding existing equipment, or installing automatic process control equipment);

As you can see from the above, there are many methods of waste reduction limited only by your creativity. Any organization can reduce the amount of wastes it generates. Sometimes by stepping back a little and looking at a particular operation from a different perspective, one may even come up with a simple but cost effective method of waste reduction.

Cynthia Folkerts (Folkerts, Eby, and Lonsbury, 1988) from the U.S. Environmental Protection Agency recounts the following case history. In a medium sized plant, the glue operator of each shift started a new barrel of glue at the beginning of the shift because he didn't want to be the one responsible for stopping the operation while he switched barrels. The result -- 40 to 50 drums one quarter to one third full of dried glue per month which needed to be disposed of. The sollution -- installation of a lockable glue pump that could only be removed by the supervisor. Savings -- for an initial capital cost of $200, an annual savings of $10,000 was realized. Other simple operating changes made at little cost can often result in substantial waste reduction and process improvement as well as savings.

Waste Minimization Process

The intent in implementing a waste reduction process is to ensure that waste generation is minimized as much as possible. For this reason I will use the term "waste minimization" when referring to the overall process or program.

So how can one implement a waste minimization program? There are a number of variants such as shown in Figure 1. However, all effective waste minimization processes have a number of basic parameters in common.

The first thing that needs to be done is to obtain management support. This is often the most crucial barrier that must be overcome. The points presented above, and the literature referred to in the Bibliography can be used to help obtain this support. We would also be prepared to support you in our own limited way to help you gain this support.

The second step is to identify the person or persons who will be responsible for overseeing the program. In a small organization it may be adequate to identify one person, but in a larger organization it is better to set up a task force consisting of representatives from all parts of the organization (e.g. production, maintenance, quality control, research and development, purchasing and accounting) to oversee the program from initial planning to implementation and evaluation.

The third step is to conduct a comprehensive review of a plant's or facility's operations. This is often called a waste audit. The term "Waste Audit" means more than the words would indicate; it means an all-encompassing review of all processes and procedures which may contribute to the generation of wastes

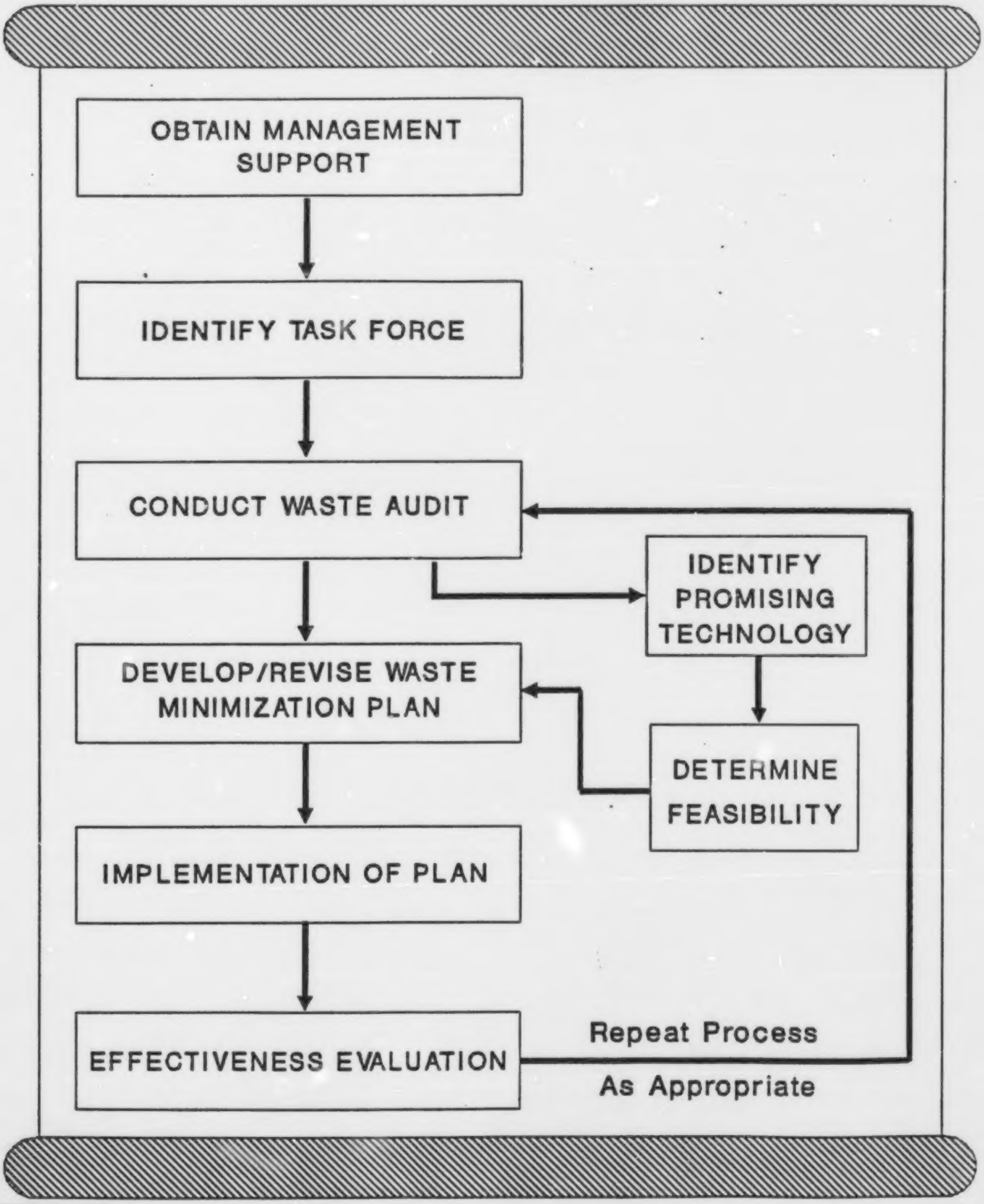
OBTAIN MANAGEMENT SUPPORT
IDENTIFY TASK FORCE
CONDUCT WASTE AUDIT
IDENTIFY PROMISING TECHNOLOGY
DEVELOP/REVISE WASTE MINIMIZATION PLAN
DETERMINE FEASIBILITY
IMPLEMENTATION OF PLAN
EFFECTIVENESS EVALUATION
Repeat Process
As Appropriate

FIGURE 1.

which are ultimately disposed of in the atmosphere, in water, or on land. The waste audit provides the key inputs for a waste reduction program.

A waste audit is similar to an environmental audit, except that it is more specific and not as all-encompassing. A waste audit could be considered as a subset of an environmental audit.

Some people feel uncomfortable when they hear the word "audit". For this reason some researchers prefer to use other terms. You should use whatever term you and other employees are most comfortable with.

After completion of the waste audit, a wast minimization plan needs to be prepared. This plan needs to be sold to senior management and then implemented. The effectiveness of the plan in actually minimizing wastes must also be monitored and evaluated, and further changes made as necessary. Waste minimization is a dynamic process which needs continual modification to ensure that the most up to date and applicable scientific waste reduction techniques are implemented.

The waste audit and subsequent evaluation may identify promising waste reduction techniques which cannot be implemented until the feasibility of these techniques can be assessed.

A prerequisite for an effective waste minimization program is to set goals, to monitor achievement of these goals, and to let staff know how effective they are in achieving these goals via a newsletter or some other means. It is also important to initiate some type of incentive program and to recognize staff excellence in waste reduction.

The importance of proper staff training to "think waste reduction" as well as in how to implement the waste reduction recommendations, cannot be overemphasized.

Waste Audit

So how does one conduct a waste audit? Different people use different approaches - there is no one way. The same researcher may even use somewhat different procedures at different facilities where it is warranted. Flexibility is the key to carrying out an effective waste audit.

A waste audit is best done by someone who 1)is familiar with the processes and procedures used by a particular facility, and 2)has a strong technical background and proven problem solving ability. In a small facility, a waste audit can be carried out by one person, but in a larger facility, it may be necessary to have more than one person.

A waste audit can be conducted by in-house personnel or by a consultant. Drabkin (1988), makes a case for using consultants or qualified personnel from other plants of the same corporation in order to avoid bias. There are, obviously, pros and cons for using either in-house or consultant expertise. If resources are a key issue, then it is preferable to conduct an in-house audit and to start implementing a waste reduction program, no matter how limited it might be. You and management will need to decide which approach to take.

A waste audit can be broken down into several components - a plant walk-through, and a review of written material such as procedures, reports, permits, and inventories. In organizations where complex processes are used, it may be necessary to familiarize oneself with the type of processes used prior to the actual plant walk-through. Furthermore, a material balance and/or a sampling program may also have to be carried out to determine where feed materials are wasted and what materials are entering the environment in what concentrations. A material balance is particularly important to help identify losses of very hazardous materials.

If a waste audit is to be conducted by a consultant that is not familiar with the facility, it may be advantageous for the consultant to have appropriate staff complete a questionnaire that can be used for familiarization purposes prior to conducting the plant walk-through.

Plant Walk-through

The plant walk-through is the most difficult and time consuming, but crucial to any waste minimization effort. The purpose of the plant walk-through is to, essentially, document everything that is going on. In a small organization, a plant walk-through could be conducted in a few days, while in a large organization, it may take weeks. The time spent should be adequate to ensure that the information collected reflects the normal day to day operations; normal operating periods.

Contemplating a waste audit of a complex facility can be overwhelming, to say the least. In such cases, it is advantageous to divide the facility into unique self standing sections and to treat these sections as separate but interconnected entities. After collecting preliminary information at Stony Mountain Institution, I decided that that was the best approach to take because the Institution was divided into unique sections with its own staff and supervision. Splitting the facility into unique sections was straightforward since the facility can be readily divided into more than twenty functional units such as maintenance garage, hospital, and greenhouse.

A plant that cannot be easily divided into unique functional units could probably be best divided according to unit processes. This is the approach recommended by the Ontario Waste Management Corporation (1989) which states that "The first step in the waste audit is to identify and list all your unit processes (grinding, painting, plating, dyeing, filtering, etc.) and then assemble as much information on them as possible." Drawing process flow diagrams can help in identifying and understanding the unit processes and plant operation. Care, however, must be taken with this approach so as not to forget ancillary operations such as pest control, in use PCB equipment, and maintenance sections which are not part of any processes that directly contribute to the production of an end product.

A plant walk-through is conducted by observing all activities and operations and by supplementing observations with judicious questions to both supervisory and operational personnel. The idea is to get as comprehensive a snapshot as possible of what happens in each area. This may mean that more than one plant walk-through may be required where it is found after the first walk-through that certain questions still need to be answered or that additional data needs to be obtained.

The general type of information that should be documented during a plant walk-through is as follows:

* type of unit processes, products, bi-products, raw materials,

water usage, and waste generation;

* methods of handling and storage of hazardous materials;
* process efficiencies and inefficiencies;
* methods of housekeeping used;
* basic procedures followed;

An example of specific information that should be documented is outlined below:

1. Hazardous materials handling and storage
    - materials handled in such a way as to minimize waste generation (e.g. product transfer procedures);
    - adequacy of underground piping and storage tank corrosion protection;
    - types of spill prevention or leak detection procedures/ systems used (e.g. drip trays, audible alarm system);
    - evaporation losses and vapour losses (e.g. storage tank pressure relief vents);
    - compatibility of storage tank/piping with hazardous materials stored/handled;
    - compatibility of chemicals stored together;
    - potential for accidental releases via open drains, uncontroled stacks, etc., into sewer systems, or directly into environment;
    - adequacy of handling precautions to minimize accidental releases.
2. On-site and off-site waste treatment/disposal/storage/re-use
    - separation of hazardous and non-hazardous wastes;
    - methods of waste treatment used;
    - types and amounts of hazardous wastes generated and dis-

posed;

  - disposal policy/practices for each type of waste;
  - methods of waste storage and potential leakage;
  - materials or wastes re-used or recycled.

3. Type of activities carried out and type and amount of hazardous materials used in each unit process or each functional unit.
4. Specific processes used.
5. Procedures followed which may adversely affect waste minimization.
6. Use and maintenance of pollution control/prevention or waste reduction equipment/facilities
   - oil and grease separators;
   - neutralization of acids/bases
   - general housekeeping;
   - filters, precipitators, cyclones, etc.;
   - solvent re-distillation;
   - reverse osmosis, ultrafiltration, and similar equipment use.

Procedure Review

Written procedures and records (either hard copy or computer stored) and, where possible, orally conveyed procedures, need to be reviewed and their implementation and/or effects assessed in order to determine their impact on waste generation and reduction.

1. Purchasing policy [e.g. purchasing in bulk may result in addiional wastes in some cases (American Chemical Society, 1985) and a reduction of wastes in others.] Are purchases

of hazardous materials reviewed periodically to assess their need or the potential for substitution?;

2. Organizational structure;
3. Methods of inventory control (e.g. prevention of generation of outdated chemicals);
4. Disposal/treatment/ waste reduction policies;
5. Procedures or plans followed which may adversely affect waste reduction (e.g. preventive maintenance, emergency response).
6. Equipment cleaning procedures including cleaning agents used.

The attitude of management and staff towards waste reduction is crucial. Every effort should be made to try to document these attitudes and whether or not they have a positive, neutral or negative effect on waste reduction.

Recommendations

You may find it interesting to see an example of the variety of recommendations that could come out of a waste audit. A few examples of recommendations I made to Stony Mountain Institution after completing the waste audit are as follows:

* investigate further feasibility of in-house solvent recovery;
* lead storage batteries should be recycled;
* removal and disposal of most toxic pesticides and substitution of less toxic ones, or using biological and other non-chemical techniques such as BT or baited/electrical fly traps;
* upgrade waste oil storage tank;
* seal drains in above ground petroleum product storage tank dyke;

- replace parts washers with more efficient ones which generate minimum emmissions from evaporation.

Summary

Waste reduction is the next rung on the evolutionary continuum of pollution control and pollution reduction; it is the only sensible way to proceed.

Hazardous waste reduction programs are not only for large companies, but rather, for any agency that handles hazardous materials. Applicable and effective waste reduction techniques can be implemented even by the smallest agency, and every little bit counts.

Waste reduction always pays.

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SAMPLING FOR AUDIT
OPPORTUNITIES FOR SOURCE BASED MANAGEMENT

BY

ROSS EDMUNDS

MANITOBA HAZARDOUS WASTE MANAGEMENT CORPORATION

OCTOBER 25, 1990

WASTE SAMPLING FOR AUDIT - NOT AS SIMPLE AS IT SEEMS

- Apply known information to waste
- Determine what else you need to know
- Legality of samples - maintain chain of custody
- Set up sampling strategy
- Determine laboratory to work with.

PURPOSE OF SAMPLING

- Characterize waste stream
    - Preliminary sampling
    - Detailed sampling
- To determine hazardous properties
    - Ignitable (flammable)
    - Oxidizer
    - Toxic
    - Corrosive
    - Reactive
    - Environmental toxicity
    - Leachable toxic substance

SAMPLING STATEGY

- Type of sample/analysis needed
    - Grab
    - Composite
    - Grid sampling
- Sampling equipment
- Type of sample containers and preservatives
    - Size of sample

- * Flow measurements
    - - Are they needed?
    - - Are flows constant?

SAMPLE MUST BE REPRESENTATIVE

SAMPLES NEED TO BE REPRESENTATIVE

- * Is waste heterogenous
- * Is random sampling necessary
- * Is composite sampling necessary
- * Grab sample is seldom representative
- * Use statistical methods to determine number of samples necessary

SAMPLE EQUIPMENT AND CONTAINERS DEPEND ON:

- * Waste type
- * How waste is contained, or location of waste
- * Type of analysis required
- * Preservative required
- * Size of sample required

SAMPLERS

- * Coliwasa (for drums)
- * Weighted bottle sampler (lakes, ponds)
- * Extendable pole and cup (grab samples)
- * Various triers and thiefs for solids

FIELD QUALITY ASSURANCE/CONTROL

- Sampling containers and equipment must be clean
- Clean samplers between use, or use clean sampler for each sample
- Trip blank (handling contamination)
- Field blank (contains water which has contacted sampling equipment)
- Field duplicates
- Document sampling procedure and any problems

CHAIN OF CUSTODY PROCEDURES

- Requires sample documentation (field book)
- Chain of custody record (to accompany sample)
- Sample label
- Sample seal

CHOICE OF LABORATORY

- Type of analysis
- Level of QA desired (laboratory competence)
- Maintenance of chain of custody
- Cost

THE ISSUE

- Awareness is limited in these areas
    - What a hazardous waste is
    - Regulations
    - How should the wastes be managed??

REACTION OF COMPANIES FACING THE ISSUE

- * Some do nothing
- * Some take "end of pipe" treatment approach (pollution control
- * Some obtain information:
  - Seminars
  - Literature
  - Associations
  - Consultants

THE CORRECT APPROACH IS: POLLUTION PREVENTION

- * Obtain information
- * Develop comprehensive waste management plan
- * Follow through with waste management program

THE NEED TO MINIMIZE AND TREAT HAZARDOUS WASTE

1. PLANNING AND ORGANIZATION

1.1 DEVELOP POLICY
1.2 OBTAIN MANAGEMENT SUPPORT
1.3 BUDGET CONSIDERATIONS
1.4 ASSIGN RESPONSIBILITY
1.5 IDENTIFY OBJECTIVES
1.6 ESTABLISH AWARENESS PROGRAM

2. ASSESSMENT PHASE

2.1 CONDUCT WASTE AUDIT
2.2 REVIEW DATA
2.3 DEVELOP OPTIONS

3. FEASIBILITY ANALYSIS PHASE

3.1 EVALUATE ECONOMICS
3.2 SELECT APPROPRIATE OPTIONS

4. PLAN PREPARATION AND IMPLEMENTATION

FATE OF MAJORITY OF WASTES

- SEWER
- LANDFILL

MANITOBA HAZARDOUS WASTE MARKET

* ESTIMATED TOTAL WASTE GENERATION	180,000 TONNES

* 87% CAN BE MANAGED AT SOURCE

* AMOUNT REQUIRING OFFSITE TREATMENT

ORGANIC WASTES	9,000 TONNES
INORGANIC WASTES	14,000 TONNES
TOTAL	23,000 TONNES

* DISPOSITION OF ORGANIC WASTES

RECYCLING/FUEL UTILIZATION/ SPECIALTY TREATMENT	6,000 TONNES
OFFSITE THERMAL TREATMENT	3,000 TONNES

* DISPOSITION OF INORGANIC WASTES

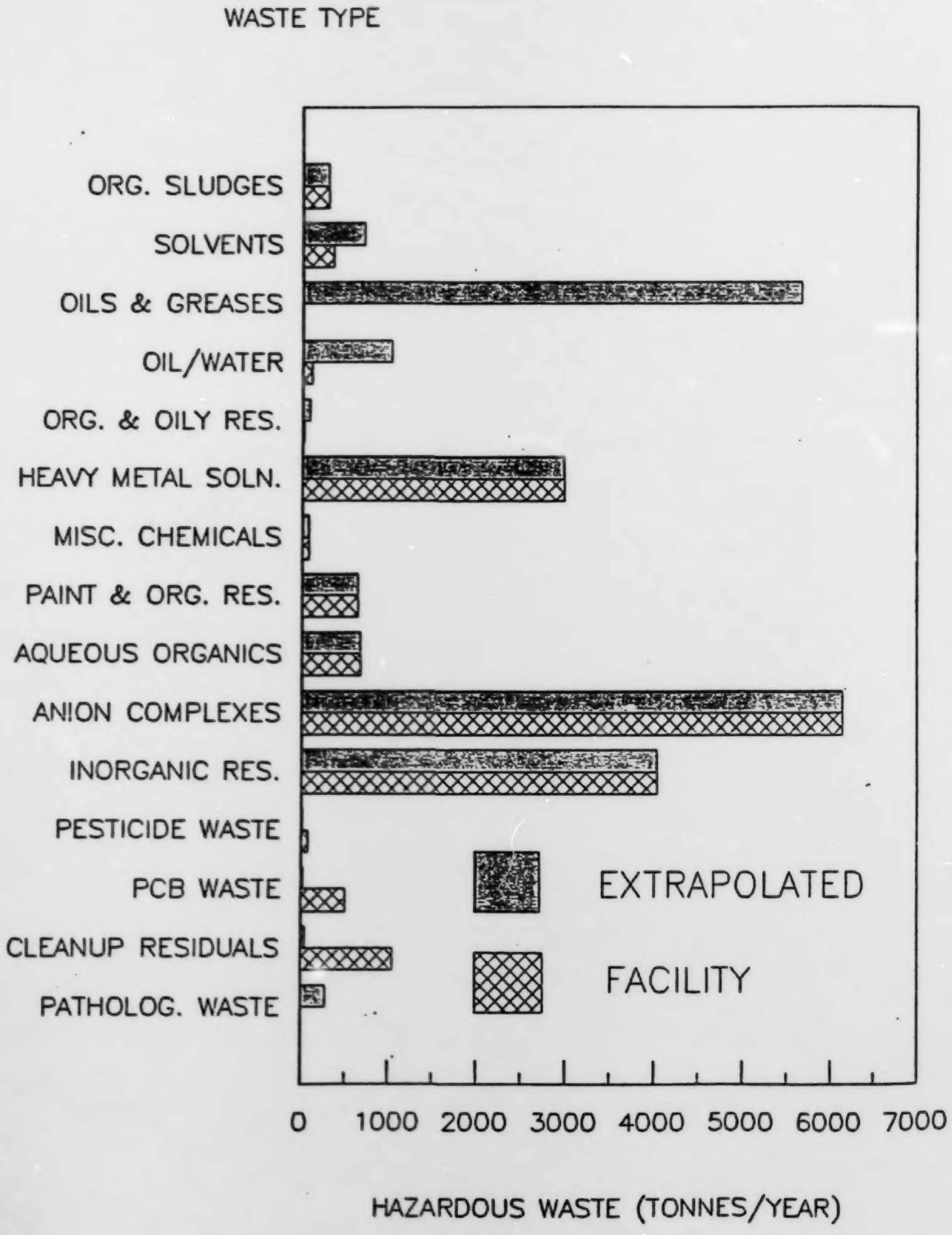
OFFSITE PHYSICAL/CHEMICAL TREATMENT	14,000 TONNES

* 80% OF WASTE GENERATED IN THE WINNIPEG REGION

* SMALL/MEDIUM SIZE METAL FABRICATION INDUSTRY IS LARGEST GENERATOR (30%)

FIGURE 2

WASTE TYPES EXTRAPOLATED/AVAILABLE TO CENTRAL FACILITY



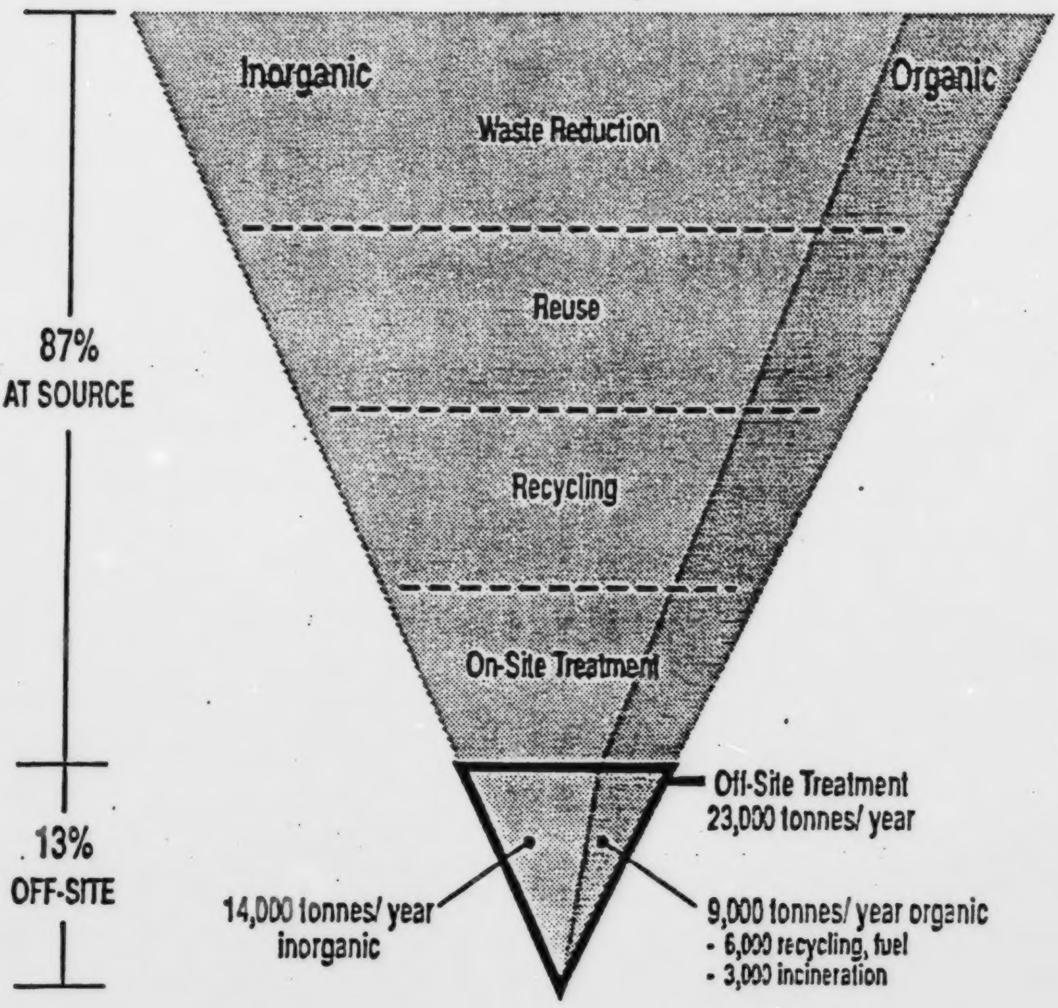
SOURCE BASED WASTE MANAGEMENT

- WASTE MINIMIZATION

THROUGH:

- REDUCTION OR ELIMINATION
- RE-USE
- RECYCLING
- RECOVERY

Managing Hazardous Waste At Source


180,000 tonnes/ year
Inorganic
Organic
Waste Reduction
Reuse
Recycling
On-Site Treatment
87%
AT SOURCE
13%
OFF-SITE
Off-Site Treatment
23,000 tonnes/ year
14,000 tonnes/ year
inorganic
9,000 tonnes/ year organic
- 6,000 recycling, fuel
- 3,000 incineration

MHWMC Services For Managing Waste At Source

- Assistance with Waste Audits
- Waste Identification
- Technical Assistance/Studies
- Direct Investment
- Technical Seminars
- Generator Services Index

WASTE MINIMIZATION STRATEGIES

- Site specific, includes efficiency, good housekeeping and, common sense
- In preferential order, reduction, reuse, recycling and, recovery
- Preventative maintenance
- More efficient operating procedures
- Improve operator training

EXAMPLES OF WASTE MINIMIZATION

- Plug leaks, restrict flows to reduce water consumption
- Install level controls to prevent overflow
- Reuse rinse water wherever possible
- Install storage tanks which are easy to clean and rinse
- Recycle: solvents, plastics, metal, plating rinsewater, fixers, developers and bleach
- Study unit processes for low waste technology potential: filters, evaporators, electrochemical, ion exchange, adsorption
- List reusable or recyclable waste in the Manitoba Waste Exchange Bulletin
- Segregate wastes!!

BARRIERS TO RECYCLING

- End of pipe mentality
- Not aware of potential
- Cost factor
- Perceive product to be inferior
- Perception of waste management

SOURCE BASED WASTE MANAGEMENT LOOKS EXPENSIVE BUT BENEFITS OUT WEIGH COSTS WITH:

- REDUCED WASTE QUANTITIES
- REDUCED RAW MATERIALS
- REDUCED WASTE TREATMENT COSTS
- REDUCED POTENTIAL LIABILITY
- BETTER PUBLIC RELATIONS
- IMPROVED PROFITS DUE TO MORE EFFICIENT OPERATION

PAY BACK PERIOD IS ONLY 1 - 3 YEARS

WASTE SOLVENT

MANY INDUSTRIES USE VARIOUS SOLVENTS.

- Look at ways to reduce or eliminate.
  - Material substitution
  - Better housekeeping

- Another company may be able to use.

- Look at recycling opportunities.

ALTERNATIVES TO DISPOSAL

- Segregate wastes

- Possible on-site recycling
  - Determine feasibility

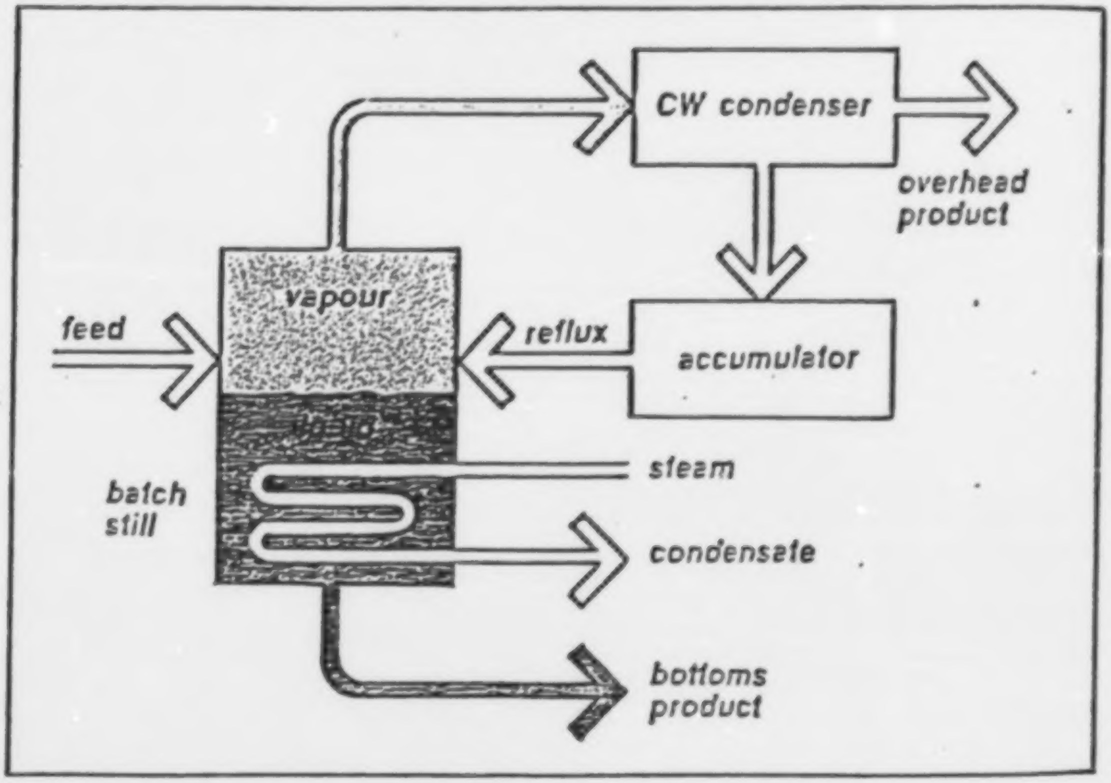
- Investigate off-site recycling
  - Commercial operator
  - Joint venture with association members

- Opposition to recycling

Batch Distillation Unit

Contaminated liquid solvent is boiled in a still to evaporate solvent. Solvent vapour is condensed and may be collected as a liquid for re-use. If the desired product is the residual liquid in the bottom of the still, distillation proceeds until the "bottoms" concentration is at the required level.

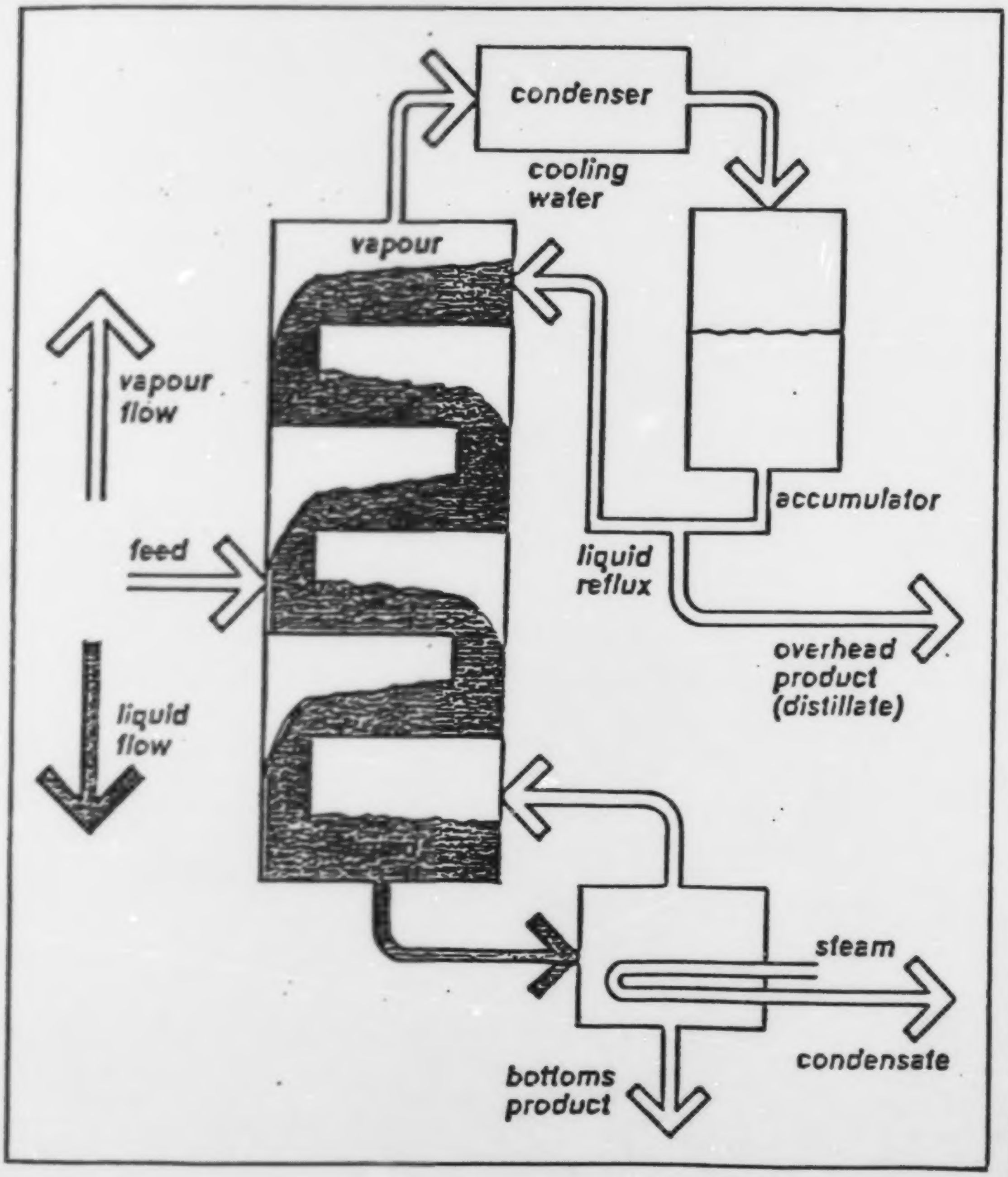
Source: Unit Operations for Treatment of Hazardous Industrial Wastes, Noyes Data Corporation, 1978.


CW condenser
overhead product
vapour
feed
reflux
accumulator
liquid
steam
batch still
condensate
bottoms product

Fractional Distillation Process

Fractional solvent distillation is used to separate waste solvent blends into component solvents. During distillation, vapours of volatile solvents move up the distillation column while less volatile solvents still in the liquid form move down the column.

Source: Unit Operations for Treatment of Hazardous Industrial Wastes, Noyes Data Corporation, 1978.


condenser
cooling water
vapour
vapour flow
feed
liquid flow
accumulator
liquid reflux
overhead product (distillate)
steam
condensate
bottoms product

WASTE OIL

* Re-refining "best" option, but not economically feasible

* Fuel use most common alternative

* Final alternative is disposal
    - Least attractive alternative
    - Use as fuel is disposal, although energy is recovered

WASTE CUTTING OIL/COOLING OILS

* Common disposal is sewer

* Can be re-used in many cases
    - Equipment available to recycle

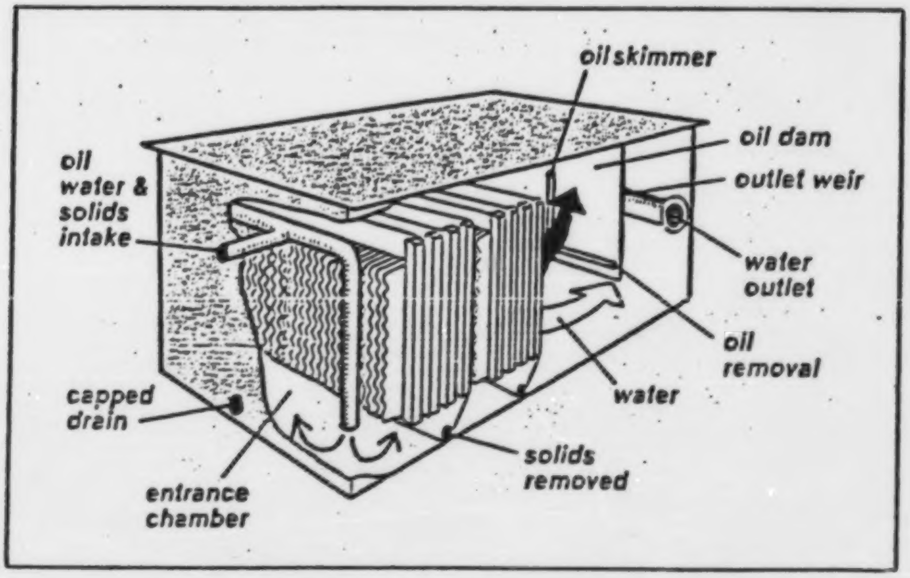
* Switch to biodegradable synthetics
    - More expensive, but can be used longer

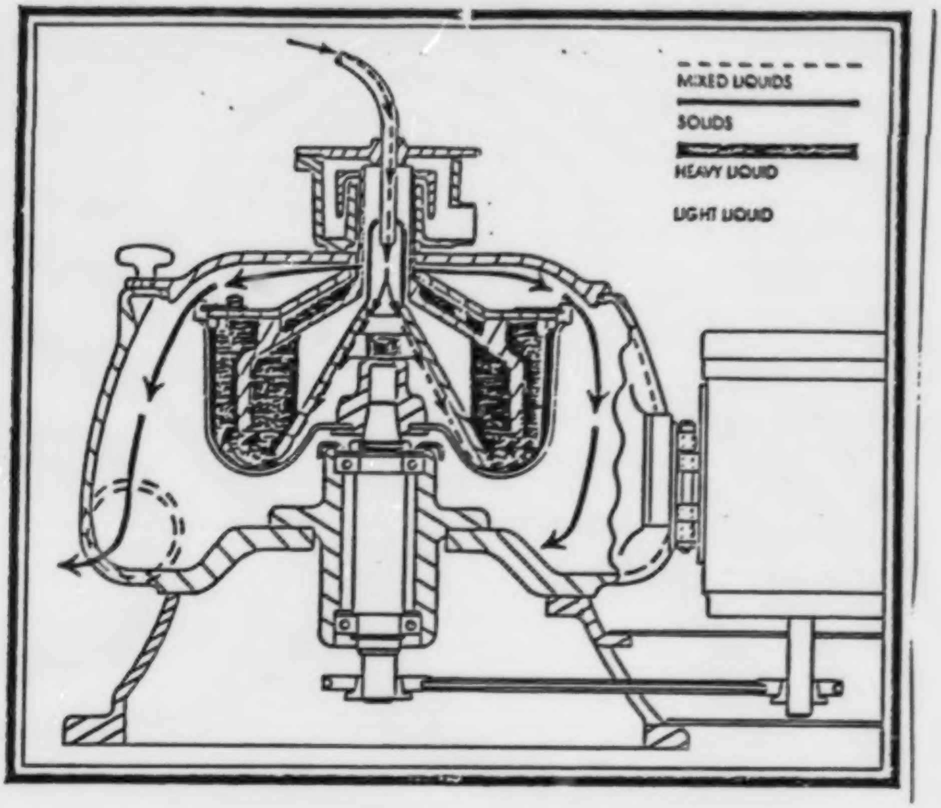
DISPOSAL

* On-site emulsion breaking
* Commercial emulsion breaking and disposal
* Most commercial operators won't take as fuel

The Fram Oil/Water Separator

The Fram oil/water separator uses a series of vertical and horizontal plates to force oil to the surface of the unit, where it is skimmed off.
Source: "Effective Methods for Difficult Effluents," *Processing*, December 1980.


oil skimmer
oil dam
outlet weir
oil water & solids intake
water outlet
oil removal
water
capped drain
solids removed
entrance chamber


MIXED LIQUIDS
SOLIDS
HEAVY LIQUID
LIGHT LIQUID

APPLICATIONS AND TYPICAL LIQUIDS SEPARATED:

- Hydraulic oil with tramp water and mineral oil.
- Machine coolant with tramp oil.
- Wash water with tramp oil.
- Lubricating oil with tramp water.
- Quench oil with tramp water.
- Cutting oil with tramp water.
- Alkaline detergent solutions with floating oil and suspended solids.

ACIDIC WASTES

- * Non-contaminated
    - Simple neutralization
- * Contaminated
    - Oil and grease removal
    - Metals removal

BASIC WASTES

- * Mainly caustic cleaners
    - Oil and grease
    - Metals (lead, zinc, chrome)
    - Suspended solids
- * Neutralization
- * Oil and grease removal
- * Precipitation
- * Flocculation
- * Dissolved air floatation (DAF unit)

NEW PROCESS BEING DEVELOPED FOR CAUSTIC CLEANERS

- PRE FILTER
  - SOLIDS REMOVAL
  - OIL AND GREASE REMOVAL
- ULTRAFILTRATION
  - USES MEMBRANE TECHNOLGY
  - REMOVES DISSOLVED SOLIDS
- CLEANER RECYCLED
- OIL RECYCLED

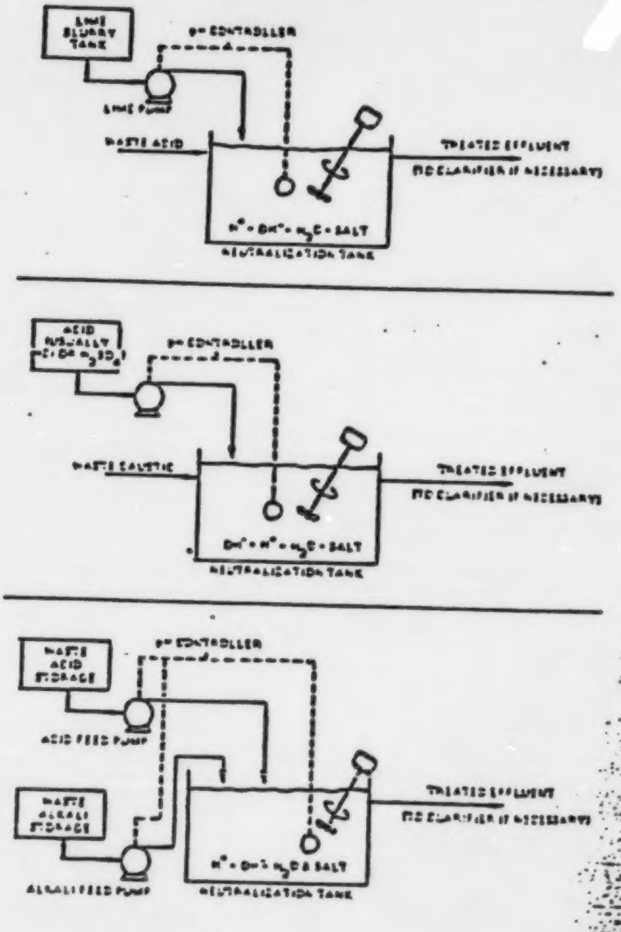
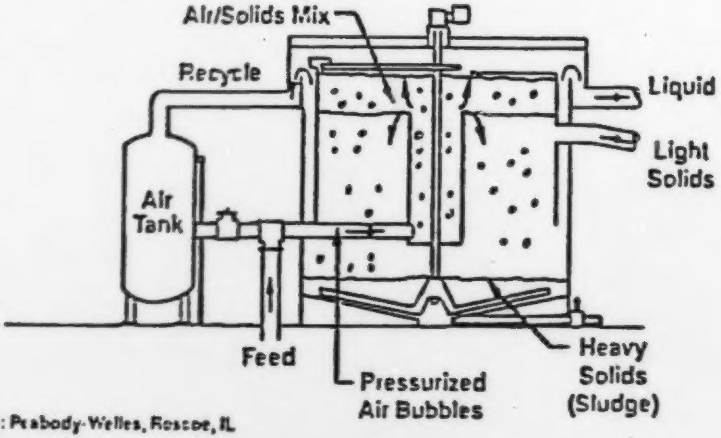

LIME SLURRY TANK
pH CONTROLLER
LIME PUMP
WASTE ACID
TREATED EFFLUENT
(TO CLARIFIER IF NECESSARY)
$H^+ + OH^- = H_2O + SALT$
NEUTRALIZATION TANK
ACID USUALLY (HCl OR H_2SO_4)
pH CONTROLLER
WASTE CAUSTIC
TREATED EFFLUENT
(TO CLARIFIER IF NECESSARY)
$OH^- + H^+ = H_2O + SALT$
NEUTRALIZATION TANK
WASTE ACID STORAGE
pH CONTROLLER
ACID FEED PUMP
WASTE ALKALI STORAGE
ALKALI FEED PUMP
TREATED EFFLUENT
(TO CLARIFIER IF NECESSARY)
$H^+ + OH^- = H_2O + SALT$
NEUTRALIZATION TANK

FIGURE 4.2
SCHEMATIC DIAGRAM OF NEUTRALIZATION


Air/Solids Mix
Recycle
Liquid
Light Solids
Air Tank
Feed
Pressurized Air Bubbles
Heavy Solids (Sludge)

Source: Peabody-Welles, Roscoe, IL

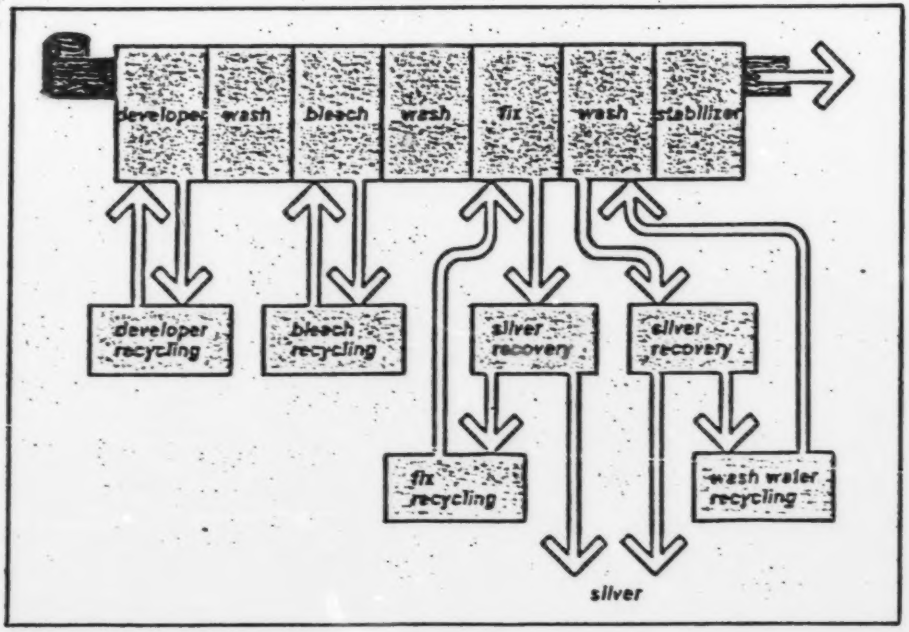
FIGURE 5.7
SCHEMATIC DIAGRAM OF RECYCLE FLOW DISSOLVED AIR FLOTATION SYSTEM

PHOTOCHEMICAL WASTES

- MEETS PROVINCIAL HAZARDOUS WASTE CRITERIA
- CITY WILL SURCHARGE SEWER DIPOSAL
  - SILVER HAS TO BE LESS THAN 5PPM
- SILVER REMOVAL TO 1000 - 1500 PRESENTLY
- NEW TECHNOLOGY REQUIRED TO MEET BY LAW
  - BETTER ELECTROCHEMICAL RECOVERY
  - ION EXCHANGE
  - OTHER (BLACK BOX)

Recycling Potential in Photo Processing

Commercially available recycling equipment exists that makes it possible to re-use spent developer, bleach, bleach-fix and fix process solutions. Equipment is also available to recover the dilute amounts of silver present in the washwater after the fix bath.


developer
wash
bleach
wash
fix
wash
stabilizer
developer recycling
bleach recycling
silver recovery
silver recovery
fix recycling
wash water recycling
silver

ELECTROPLATING INDUSTRY

- MATURE INDUSTRY
- INFORMATION AVAILABLE FROM;
  - ASSOCIATIONS
  - EPA
  - EPS
- ZERO DISCHARGE POSSIBLE
- CONVENTIONAL TREATMENT REQUIRES SOME DISPOSAL

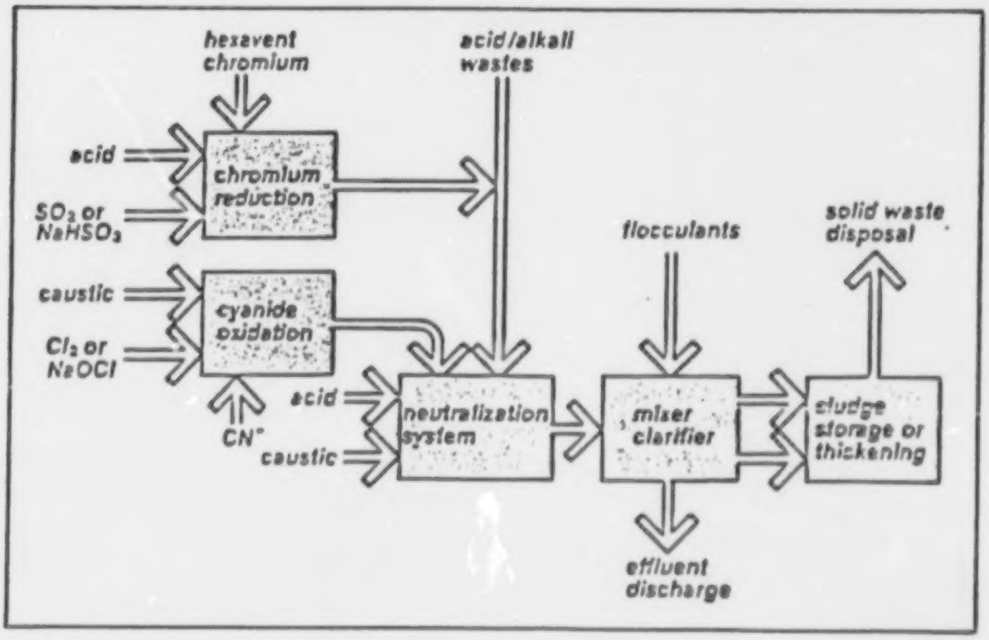
CONVENTIONAL TREATMENT

- COUNTER CURRENT RINSING
- WASTE STREAM SEGREGATION
- METAL PRECIPITATION, SLUDGE DISPOSAL
- CYANIDE OXIDATION USING HYPOCHLORITE
  - CYANATE ION SEWERED OR;
  - ALLOW FOR pH ADJUSTMENT AND COMPLETE REACTION

Simplified Conventional Wastewater Treatment for Electroplating Wastes

In conventional treatment of electroplating wastewater, chemical reagents are added to react with the soluble pollutants, resulting in the production of insoluble, metal-laden sludge. The wet sludge is dewatered or thickened, and then disposed at a landfill site.

Source: Control Technology for the Metal Finishing Industry: Evaporators, U.S. Environmental Protection Agency, June 1979.


hexavent chromium
acid/alkali wastes
acid
chromium reduction
SO_2 or $NaHSO_3$
caustic
cyanide oxidation
Cl_2 or $NaOCl$
CN^-
acid
caustic
neutralization system
flocculants
mixer clarifier
effluent discharge
solid waste disposal
sludge storage or thickening

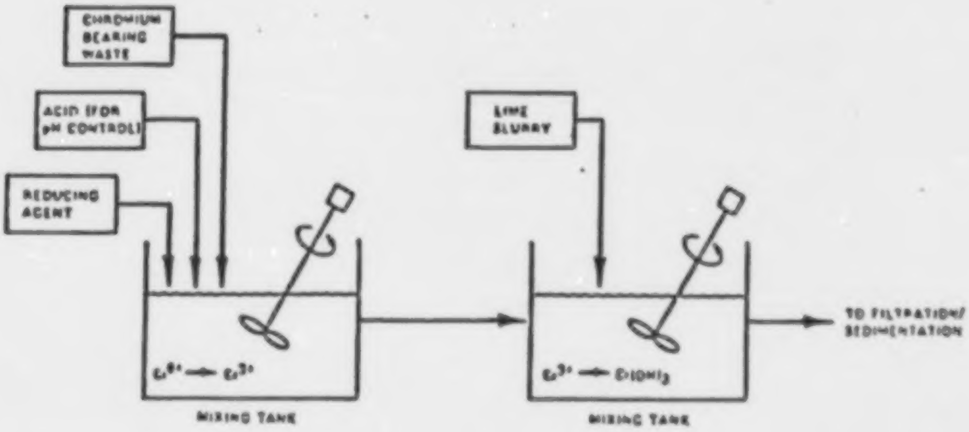

CHROMIUM BEARING WASTE
ACID (FOR pH CONTROL)
REDUCING AGENT
LIME SLURRY
Cr6+ → Cr3+
Cr3+ → Cr(OH)3
MIXING TANK
MIXING TANK
TO FILTRATION/ SEDIMENTATION

FIGURE 4.1
SCHEMATIC DIAGRAM OF CHEMICAL REDUCTION OF HEXAVALENT CHROMIUM (Cr 6+)

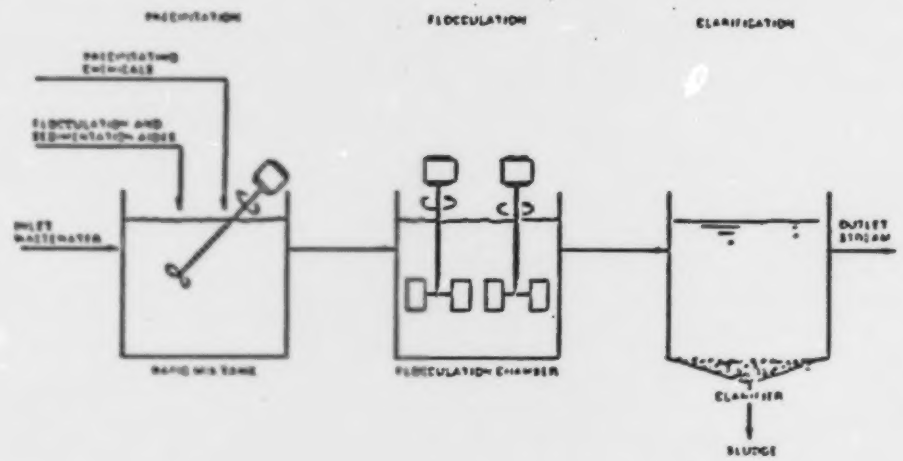
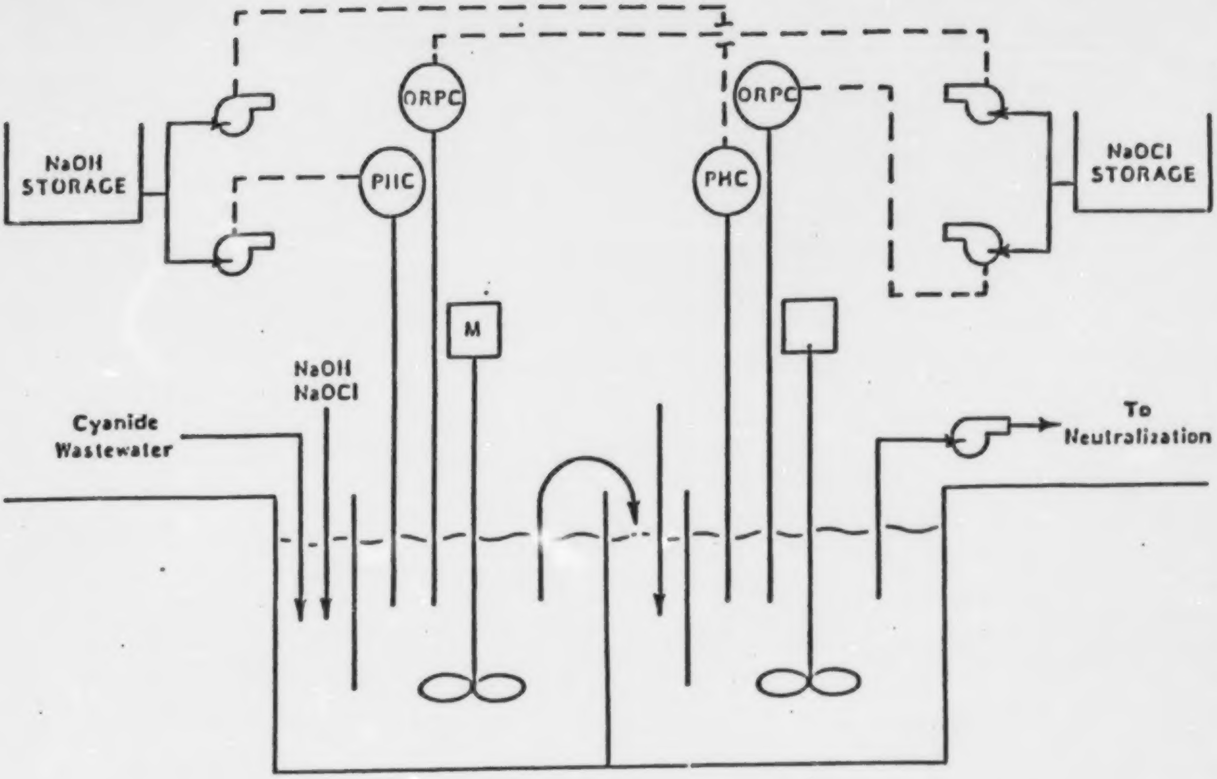
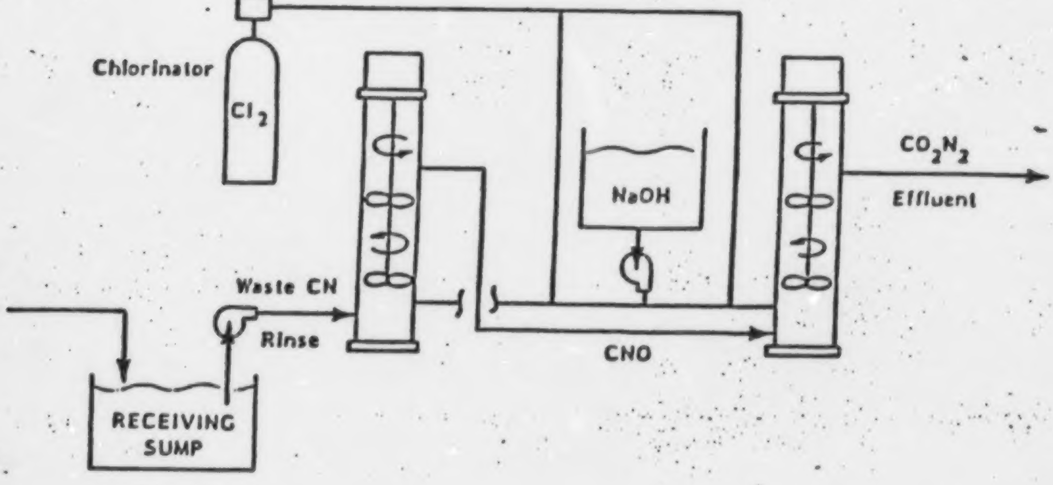

PRECIPITATION
FLOCCULATION
CLARIFICATION
PRECIPITATING CHEMICALS
FLOCCULATION AND SEDIMENTATION AIDES
INLET WASTEWATER
OUTLET STREAM
RAPID MIX TANK
FLOCCULATION CHAMBER
CLARIFIER
SLUDGE

FIGURE 4.3
SCHEMATIC DIAGRAM OF CHEMICAL PRECIPITATION AND ASSOCIATED PROCESS STEPS


NaOH STORAGE
ORPC
PHC
ORPC
PHC
NaOCl STORAGE
M
NaOH
NaOCl
Cyanide Wastewater
To Neutralization

Two-Stage Cyanide Oxidation System

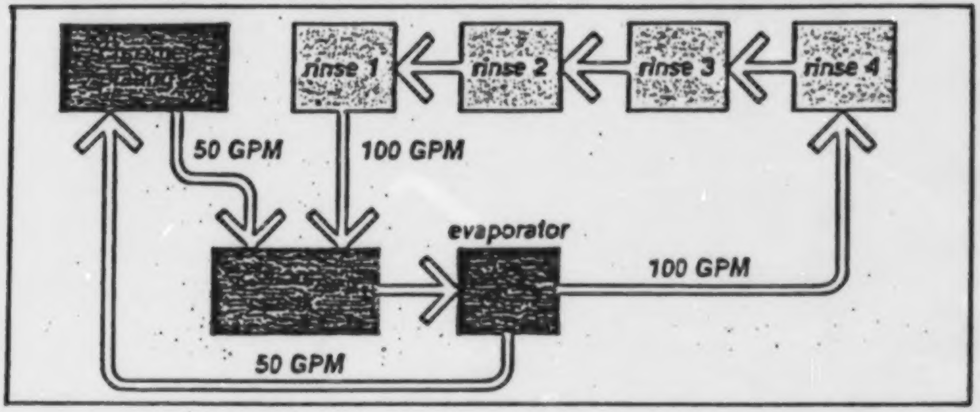

Chlorinator
Cl_2
NaOH
CO_2N_2
Effluent
Waste CN
Rinse
CNO
RECEIVING SUMP

Reaction Tower-Type Two Stage Cyanide Oxidation System

Closed-Loop Evaporator System at Sommer Metalcraft

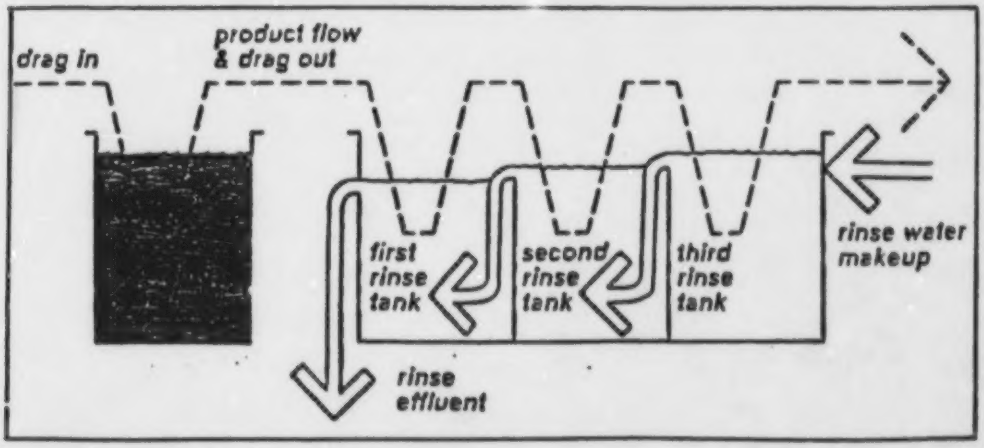
In addition to recovering waste heat from the chromium plating tank, the evaporator system returns distilled water to the last (fourth) counter-current rinse tank. A continuously operating cation exchange unit removes copper ions and other contaminants from the rinsewater.

Source: "Recovery Pays at Sommer Metalcraft," Industrial Finishing, June 1980.


rinse 1
rinse 2
rinse 3
rinse 4
50 GPM
100 GPM
evaporator
100 GPM
50 GPM

Counter-Current Rinse System

Counter-current rinsing is used to reduce the total amount of water required to rinse the product. The product is rinsed first in the most contaminated rinse bath, and last in the cleanest bath. Clean water is added to the last rinse tank, which overflows up the row of rinse tanks in a direction opposite to the movement of the product.


drag in
product flow & drag out
first rinse tank
second rinse tank
third rinse tank
rinse water makeup
rinse effluent

NEW TECHNOLOGY

USED IN COMBINATION WITH OLD SYSTEMS

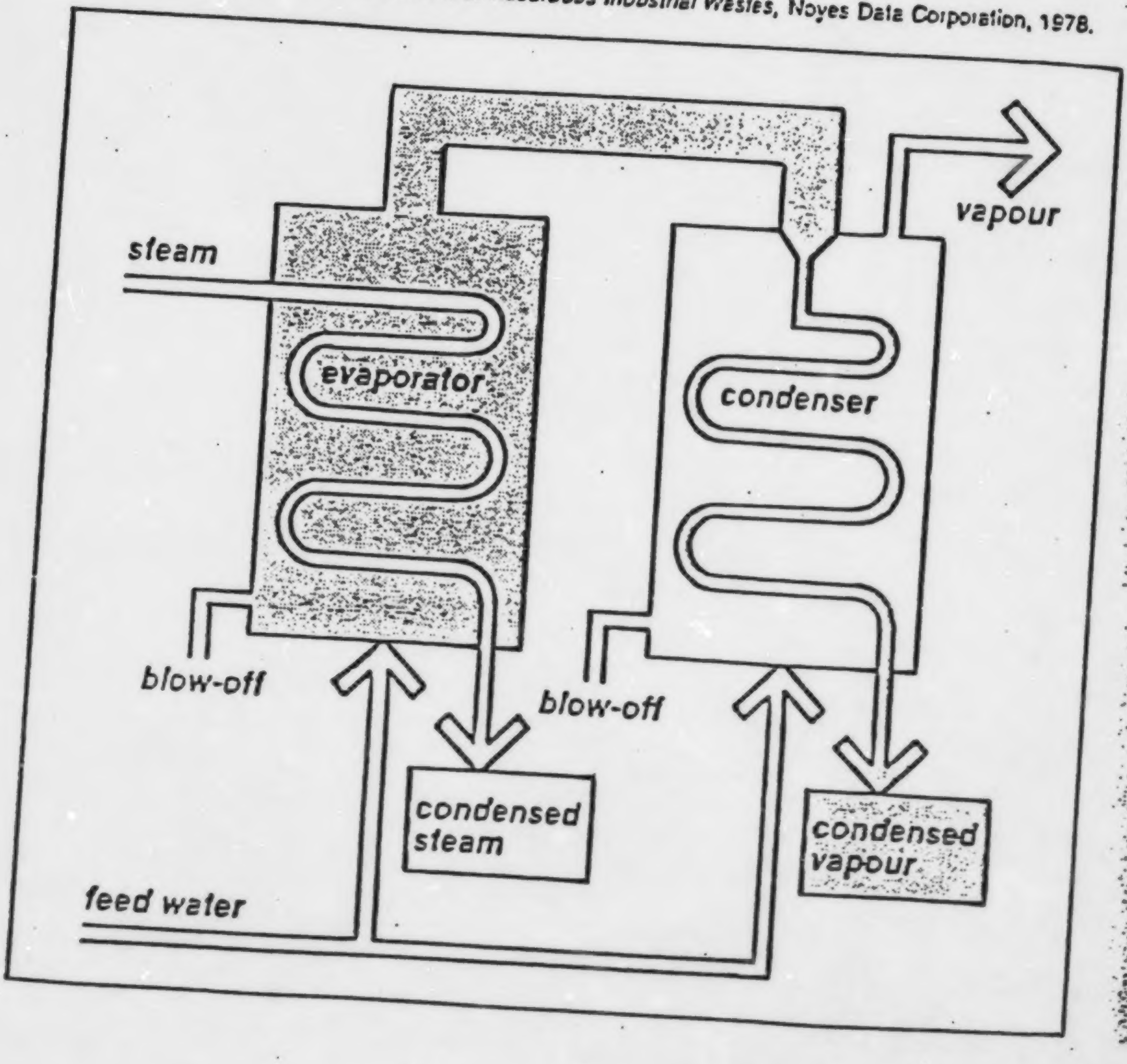
- ION EXCHANGE
- USE OF EVAPORATORS
- CYANIDE DESTRUCTION BY HYDROLYSIS
- BATH PURIFICATION AND REGENERATION

RESULT IS WASTE WATER TREATMENT AND RECYCLING WITH NO DISCHARGE OF HAZARDOUS WASTE

Evaporator System

Wastewater is boiled to drive off water. The distilled water vapour can be condensed and re-used. The remaining wastewater is concentrated enough to permit re-use or treatment.

Source: Unit Operations for Treatment of Hazardous Industrial Wastes, Noyes Data Corporation, 1978.


steam
evaporator
condenser
vapour
blow-off
blow-off
condensed steam
condensed vapour
feed water

AES Research Project 53A:

Cyanide Destruction In A Commercial-Scale Hydrolysis Reactor

By H. L. Robey

Cyanides were hydrolyzed efficiently (99.8 to 99.99 percent) in a commercial prototype reactor at temperatures of 232 to 260° C (450 to 500° F) and pressures of 0.4 to 0.6 kg/mm² (620 to 875 psi), confirming expectations based on laboratory studies. Drummed, inorganic cyanide sludge was successfully treated but that containing organic material did not solubilize readily. A treatment cost of $0.62 to $1.78/lb of cyanide destroyed was calculated, depending on whether liquid or drummed waste was treated and the method of post-treatment.

In 1979, AES Project 53 was initiated as a laboratory program with the objective of investigating hydrolysis as an alternative to alkaline chlorination for the destruction of soluble cyanides in electroplating waste. The laboratory investigation showed that even the most resistant cyanide compounds—namely, copper cyanide and potassium ferricyanide—could be hydrolyzed in a reasonable time at moderate temperature and pressure. These parameters for potassium ferricyanide were found to be 90 min, 270° C (520° F), and 0.63 kg/mm² (900 psi).[1]

The process of hydrolysis is a chemical reaction between the cyanide and the water. Because cyanide waste consists of 90 to 95 percent water, additional chemical reactants are not required. The waste has only to be heated to and maintained at the suggested reaction temperature for the required residence time.

The products of the reaction are ammonia or ammonium hydroxide and a metal formate. Illustrating the chemistry using sodium cyanide, the reaction proceeds as follows:

$$NaCN + 2H_2O \rightarrow NaCOOH + NH_3 \qquad (1)$$

or

$$NaCN + 3H_2O \rightarrow NaCOOH + NH_4OH \qquad (2)$$

Two types of waste were investigated: (1) concentrated cyanide stripping or plating bath waste, and (2) higher-volume, low-concentration cyanide rinsewater. The conditions required to accomplish cyanide destruction for both types were the same, but process engineering was different. The high-strength wastes were treated using a batch pro-

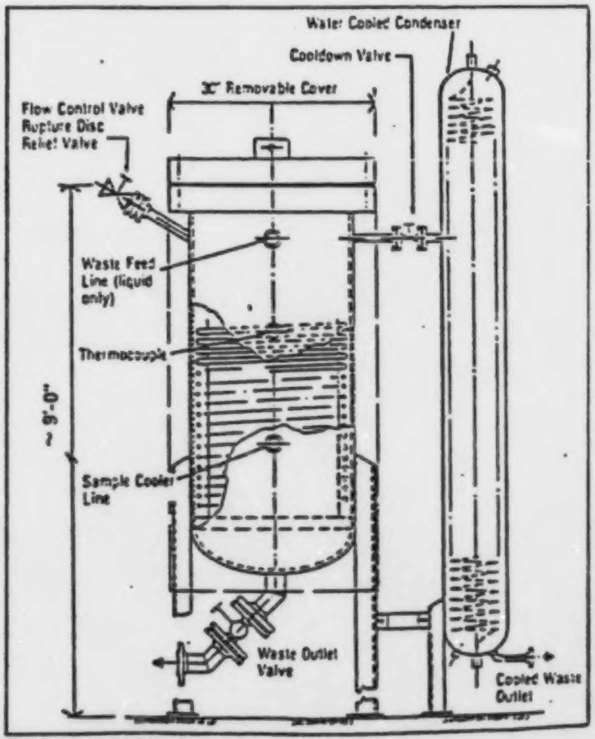


Fig. 1—Sketch of batch reactor.

PAINTING AND COATING

- METAL FINISHING REQUIRES SOLVENT BASED PAINT
- WATER WALL SPRAY BOOTH USED
- UP TO 40% OF PAINT LOST TO OVER SPRAY
- SLUDGE AND WATER ARE CONSIDERED HAZARDOUS WASTE
  - CONTAIN SOLVENT, TOXIC METALS
  - DISPOSAL COSTS HIGH
- PAINT LINE CLEANING SOLVENTS GENERATED

Pressure Atomized Spray Painting

In airless spray painting, paint is forced through the nozzle at high enough pressure to propel the paint forward.

Source: Calculations of Painting Wasteloads Associated with Metal Finishing, U.S. Environmental Protection Agency, June 1980.

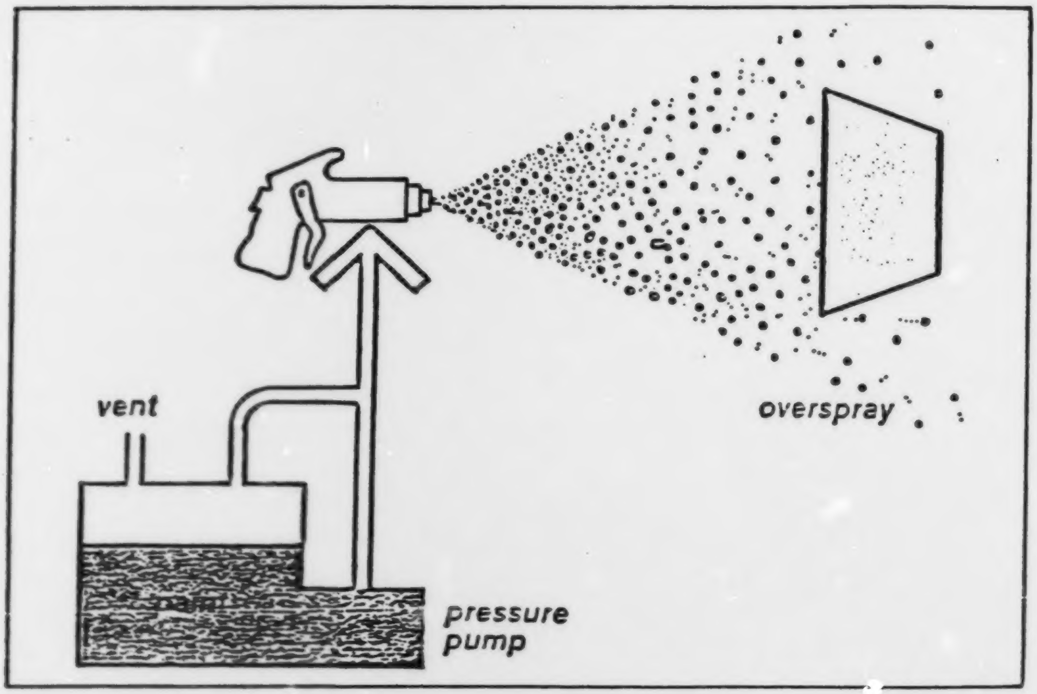

vent
overspray
paint
pressure pump

Figure 7

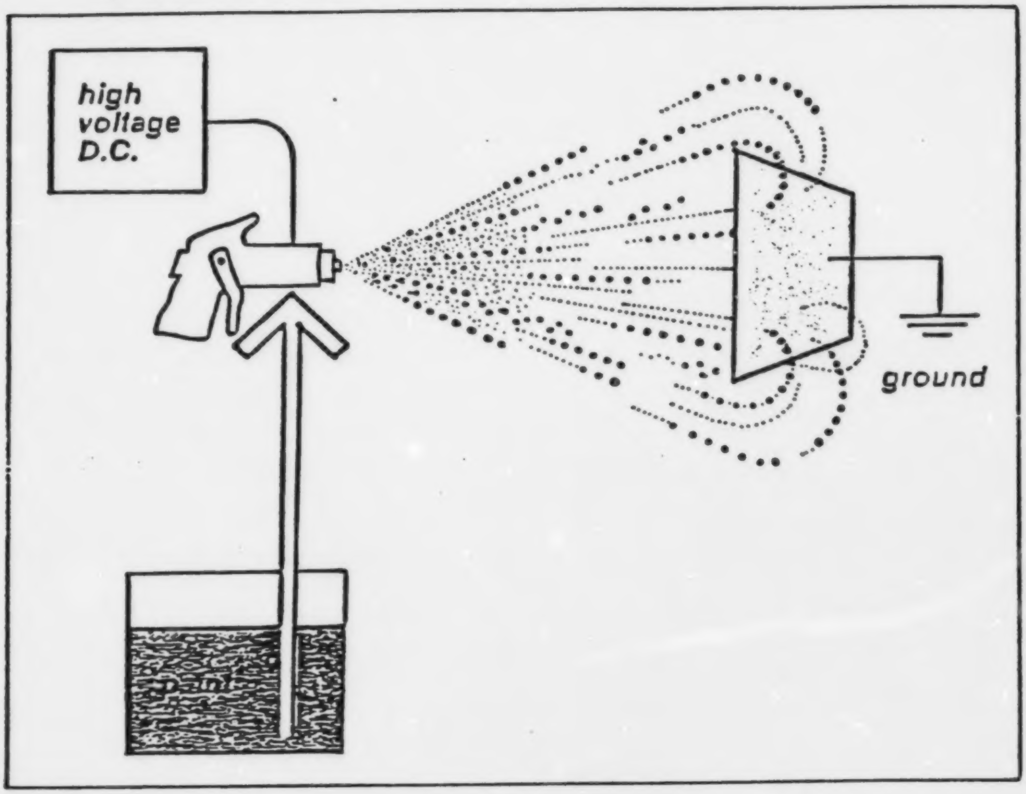
ALTERNATIVES

- ELECTROSTATIC SPRAY PAINTING
- SLUDGE AND SOLVENT REMOVAL FROM WATER
- POWDER PAINTING
  - COLOUR SWITCHING HARDER
- ELECTROCOATING

Electrostatic Spray Painting

The object to be painted is grounded and the paint is given the opposite charge. Overspray is greatly reduced because the paint is attracted to the opposite charge on the object being painted.

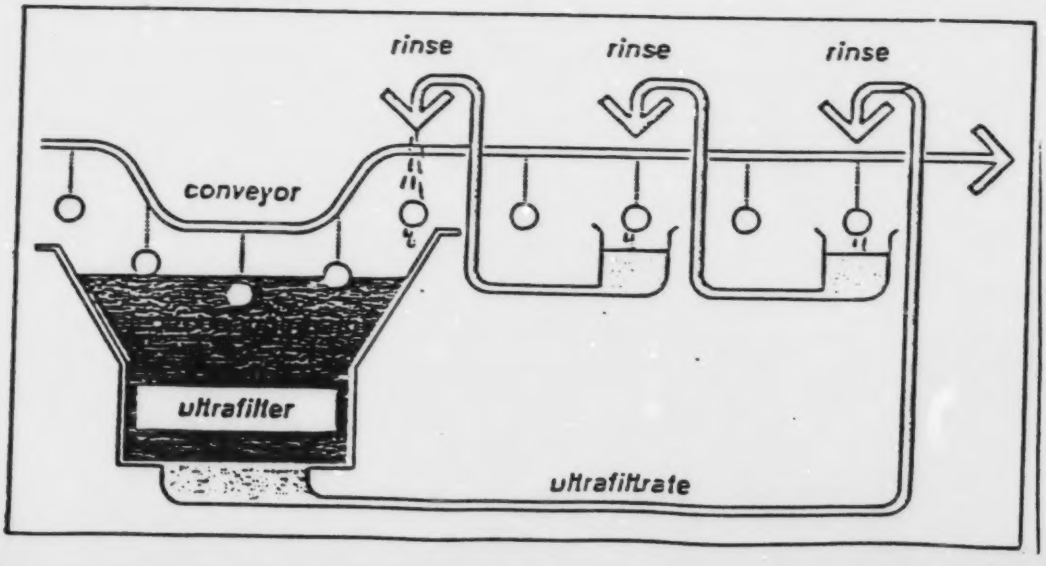
Source: Calculations of Painting Wasteloads Associated with Metal Finishing, U.S. Environmental Protection Agency, June 1980.


high
voltage
D.C.
ground
paint

The Electrocoating Process

Electrocoating can be 90 to 99% efficient in paint usage. The high transfer efficiency is due in part to closed-loop rinsing. Loose paint particles in the rinsewater can be recycled back to the coating tank.

Source: Calculations of Painting Wasteloads Associated with Metal Finishing, U.S. Environmental Protection Agency, June 1980.


rinse
rinse
rinse
conveyor
ultrafilter
ultrafiltrate

HOW CAN WHMIS BE USED IN WASTE REDUCTION

BY

MARJORIE SCHELL

TOMARK COMPLIANCE CENTRE

OCTOBER 25, 1990

TOMARK
COMPLIANCE CENTRE

(403) 243-0550
WESTERN CANADA: 1-800-661-8344
FAX: 1-403-243-4393

HOW CAN WHMIS BE USED IN WASTE REDUCTION

INTRODUCTION

Description of problem

- With the tremendous number of new chemicals being produced in North America in recent years, many of which would be regulated by WHMIS. (rate of 6000 per day in North America alone)
- There are many unlabelled chemicals and containers that are still in the workplace wasting space, time and money.
- Impulse purchasing - this is due to not having a knowledge of what is really in the workplace.

Response to the problem

- More awareness has to be conveyed to the worker about the hazardous materials in the workplace - all workers have the right - to - know.
- WHMIS regulations
- A system of communication of Health Hazard Information between suppliers, employers and workers about materials used at the workplace.
- To protect workers who use or handle hazardous materials through the use of safety equipment and procedures.
- To achieve uniform compliance procedures among all Canadian jurisdictions.
- To identify hazardous materials at the workplace.
- Develop an educational program for the workers - including waste materials.

MECHANICS OF WHMIS

The Workplace Hazardous Materials Information System, frequently referred to as WHMIS, is the new buzz word through out Canadian Occupational Health and Safety circles nowadays. It affects nearly all types of Canadian business', moreover, WHMIS was law on January 20, 1988 when bill C-70 was gazetted for the second time and it came into force October 1988.

WHMIS is an informational communication system which has long term potential benefits to health, industry and the environment. It is a National Canadian standard and is designed to ensure that all employers obtain information concerning hazardous materials in their work places so they may properly inform and train their employees who in turn will be better able to protect themselves against the potential hazards of the materials with which they work with.

WHMIS has been achieved via a consensus of government, industry and labour and it establishes a uniform set of requirements so that hazards of materials produced, sold to , imported into or used in Canadian workplaces are identified using a standard set of criteria. Such hazardous materials are referred to as CONTROLLED PRODUCTS under the Hazardous Products Act and Regulations. These are all types of chemicals which have inherent hazardous properties and include many materials used daily in industry. It therefore affects most suppliers, importers, distributors and manufacturers of chemicals and nearly all workplaces as well as everyone who uses, handles, is exposed to or is potentially exposed to controlled products in a workplace.

WHMIS is designed to protect Canadian workers by providing vital information about hazardous materials used in the workplace via the transfer of information of from producers, suppliers and importers to employers and employees. It balances the employees right-to-know with the need to protect sensitive proprietary information.

To achieve this, the key features of WHMIS include criteria to identify hazardous materials in the workplace and to provide information about them; a cautionary labelling system for containers; requirements for disclosure of information via material safety data sheets (MSDS) and a mechanism to protect sensitive proprietary information; employee education programmes.

HISTORY

The increased interest in occupational health and safety in Canada in recent years has led to the development of a system to identify workplace hazardous materials and to provide workers with detailed hazardous information about them. The product of this Exercise is WHMIS.

In July 1981, Federal and Provincial occupational safety and health regulatory agencies suggested to the Canadian Association of Administrators of Labour Legislation (CAALL) that a nationally consistent information system of hazardous workplace materials be established. The Federal, Provincial and Territorial Occupational health and safety authorities would control the use of hazardous materials in the workplace and the provision of hazard information to employees.

Federal legislation was deemed necessary to implement a uniform information delivery system throughout Canada based on information from the supplier of the hazardous materials. This in turn led to the formation of a Federal/Provincial Task Force to study the feasibility of labelling hazardous materials both in the workplace and at the supplier level. The task force reported to CAALL in April 1982 and recommended an information delivery system consisting of warning labels, material safety data sheets (MSDS) and employee education programs.

The task force report recommended that containers of hazardous materials be labelled both to alert employees and to provide basic information for use in the protection of the employee. MSDS's were to be provided with comprehensive information about possible short and long term health effects and to provide necessary data in relation to protective measures. The employee education program was to provide workers with an understanding of the information provided as it related to them and their daily job functions.

The WHMIS project was started by Labour Canada in mid 1982. In April 1985 the Steering Committee issued its final report and made recommendations on implementations to the Federal Deputy Minister of Labour.

On June 30, 1987 bill C-70 was passed in the House of Commons to amend the Hazardous Products Act and the Canadian Labour Code, to enact the Hazardous Materials Information Review Act and to amend other related acts.

On December 31,1987, the Controlled Products Regulations were passed to ensure that controlled products destined for Canadian workplaces be protected with labels and MSDS's. The Hazardous

Materials Information Review Act and Regulations were also passed to protect genuine trade secrets. An amendment to the Canada Occupational Safety and Health Regulations under Canada labour Code Part IV was also passed on the same date.

The compliance date for provision of the required information by suppliers such as labels and MSD's was set for October 31, 1988 for "primary" suppliers and later amended to March 15, 1989 for "secondary" suppliers, i.e. those who purchase chemicals to formulate into other products which they can sell. No hazardous materials (controlled products) can be shipped to Canadian work places after these dates without the required information under WHMIS.

WHMIS AND RELATED LEGISLATION

In order to implement WHMIS and provide hazard information at the supplier level, it was necessary to amend the existing Consumer and Corporate Affair's Hazardous Products Act to extend its jurisdiction to cover hazardous substance destined for the workplace. The controlled products that are referred to include compressed gasses, flammable and combustible materials, oxidizing materials, poisonous and infectious materials, corrosive material and dangerously reactive materials. These are termed Classes A, B, C, D, E, and F respectively. However, the Regulations do not generally apply to the sale or importation of the following categories of materials:

a. Explosives within the meaning of the explosive Act.

b. Cosmetics, devices, drugs or food within the meaning of the Food and Drugs Act.

c. Control products within the meaning of the Pest Control Products Act.

d. Prescribed substances within the meaning of the Atomic Energy Control Act.

e. Hazardous Waste.

f. Products, materials or substances that are subject to regulations under Part I of the Hazardous Products Act (Consumer Products).

g. Wood or products made of wood.

h. Tobacco or products made of tobacco.

i. Manufactured articles.

With the exception of Federally regulated establishments, such as the Post Office, Military Bases, etc. most of the workplace health and safety programmes fall under the jurisdiction of provincial and territorial governments. To be able to implement the information delivery to the employee, it was necessary to amend existing provincial and territorial workplace health and safety legislation to compliment the Federal Controlled Products Regulations.

One of the objectives of the WHMIS program is to try to achieve a uniform set of regulations and compliance standards across the country. The Federal Government, and the Provincial and Territorial Governments agreed to a common approach and a Model Occupational Safety and Health Regulation was developed as a reference. The provinces and territories have developed regional regulations based on the Model OSH Regulation. The key deliveries in the WHMIS regulations are:

1. Material Data Sheets.
2. Labels both supplier and workplace.
3. Worker education.

MATERIAL SAFETY DATA SHEETS

The MSDS is the key to the WHMIS Regulations. The manufacturer or supplier of the controlled product is required to prepare the MSDS. He has nine categories to cover; Hazardous Ingredients, who prepared it and the date; Product Information; Physical Data; Fire and Explosion Hazard; Reactivity Data: Toxicological Properties; Preventive Measures and First Aid.

There is no government standard as far as the MSDS is concerned. All MSDS's are not to be more than three years old and must be made readily available to the workers, safety committees, medical offices and the fire departments. These MSDS's must be available in both French and English.

The manufacturer or supplier of the controlled product must transmit a copy of the MSDS to the employer prior to or with the controlled product before it is used in the workplace.

SUPPLIER LABEL

The supplier label must contain the following information.

a. Product Identifier
b. Supplier Identifier
c. Reference to MSDS

d. Hazardous Symbols
e. Risk Phrases
f. Precautionary Measures
g. First Aid Measures
h. Must be in both English and French

This information will be contained within a hash mark border. There is no colour criteria for these labels or symbols.

WORKPLACE LABEL

This is a label which is put together by the employer for his workplaces. This label will vary from company to company. The requirements for this label are:

a. Product Identifier
b. Information for the safe handling of the Controlled product.
c. Reference to MSDS

Employers have to communicate the relevant hazard information associated with chemicals in their workplace to the employees. They must make sure all containers are appropriately labelled along with all pipes, vessels, valves, etc.

EMPLOYEE TRAINING

There is a requirement for employee training. The whole purpose of WHMIS is to produce an employee who is trained and educated in the hazards of the materials he uses and the methods of handling them safely. The more informed and aware the employees are the better able they are to understand and apply hazard information accordingly, resulting in the improved safety and health of themselves, their fellow workers and their workplace. The training is directed at those who use, handle, are exposed to or are potentially exposed to controlled products in the workplace. The training program must be reviewed at least annually.

This is a set of regulations which should have been put into place long before now and maybe there would not have been as many health problems and large claims.

If WHMIS is effectively developed in the workplace, the employer and or employee should be able to both minimize and reduce waste products. The employer and or employee should be able to identify as to where the waste should be disposed of, e.g. either landfills; by recycling within the workplace or in a commercial recycling operation; or by avoiding or eliminating waste generated within the workplace.

The MSDS provides important information on a substance's physical and chemical properties as well as health effects. A good knowledge of these properties can reduce waste and save money.

The second component, labels, can help also in the reduction of waste as all controlled products (Hazardous Substances) must be labelled by the supplier and if decanted in the workplace a workplace label is applied. These labels reduce the risk associated with mistaken usage or disposal of the wrong substance, therefore, this will reduce the amount of waste.

The third component alone, Workers Education and Training, can bring about successful waste minimization. When workers have knowledge of the properties of hazardous substances, they will know how to avoid harmful effects and use these chemicals with more respect and efficiency.

Waste reduction succeeds when it is part of the everyday consciousness of all workers and managers involved with production. Inadequate information makes it difficult for waste generators to look at the long term with respect to waste reduction.

What sometimes appears to be an endless task, will deliver unexpected benefits. WHMIS, when implemented effectively, along with an eye for the opportunity, will both minimize and reduce hazardous waste in your workplace.

We've made a good beginning with WHMIS and the workers right-to-know, in the area of waste minimization in the workplace. We have to further address the community's right-to-know about hazardous substances that effect the public as a whole. In the province of Alberta, they have held a series of Toxic Round-ups for the communities, and they have been a real success. The fire departments in major cities have become involved in helping the public become aware of their hazardous waste by setting dates at various stations, whereby the householder can dispose of small quantities of waste. However, it appears that down the road there will be legislation that will be beneficial to the communities right-to-know.

If you are looking to the future with a longer term view, then pay full attention to the implementation of WHMIS and it will serve you well by saving time and resources.

GOVERNMENT TOOLS TO PROMOTE AND ACHIEVE WASTE REDUCTION

BY

ROY NIXON

ENVIRONMENTAL PROTECTION

OCTOBER 25, 1990

GOVERNMENT TOOLS TO PROMOTE AND ACHIEVE WASTE REDUCTION

Roy Nixon

Second Waste Minimization Seminar
- Winnipeg, Oct. 25, 1990

I told you in my introduction to this topic that the main reason you should be practicing waste reduction is economic. It will save you money. It will improve your profits.

Why then isn't every one practicing waste reduction? I think that there are two main reasons:

1. Government has few, if any regulations, that force industry to minimize waste. And what few regulations there are, are poorly enforced or not enforced at all.

2. The cost of disposal of wastes has been too low.

   These conditions are changing at the federal level, the provincial level, and the municipal level.

Now, laws and regulations are one thing. They do have an effect, even if they are not enforced. Enforcement of regulations is costly, time consuming, and in my opinion a "no win" situation for both the enforcer and the polluter. There are better ways for government to encourage waste minimization, though I must admit that legislation and regulatory controls are important means of achieving an end. This is all too evident in the U.S.A., but I would not wish that situation on anybody, industry or the enforcers.

All levels of government have the same basic tools available to address waste minimization:

- Legislation and regulations

- Incentives and disincentives

- Communication

I propose to tell you what the federal government is doing in these three main areas. Dave Thompson will tell you after lunch what Manitoba is doing or has planned.

First let us look at the LEGISLATIVE AND REGULATORY OPTION. Government can:

- Impose limits on effluent quality and quantity

- Impose bans on disposal to landfill (e.g. no liquids)

- Ban the use of certain products (e.g., DDT, PCBs, CFC)
- Place restriction on the use of hazardous raw materials in manufacturing processes.

The federal government is presently in a "hurry up" mode to issue new regulations and upgrade (read "toughen") old ones under both CEPA and the Fisheries Act. The following are either in being, or close to it.

- P & P effluent regulations under the Fisheries Act - will be made tougher, and apply to all mills.
- Chlorinated dioxins and furans releases from P & P mills - CEPA.
- PCB waste storage - CEPA.
- New substances notification - manufacturers/importers will have to provide toxicity test information and CEPA.
- PCB release regulations: CEPA amendments.
- Import and export of hazardous wastes: CEPA, Section 43.
- Spill reporting and mandatory reporting of spills of CEPA regulated substances.
- Ocean dumping regulation: CEPA.
- Air emissions from boilers: CEPA.
- Release of lead from secondary lead smelters: CEPA, tougher.
- Emissions from non-hazardous waste incinerators.
- CFCs and several under CEPA to effect reduction in usage and prevent release to atmosphere.

Those are just a few of the federal regulations being toughened or being enacted for the first time. There will be many more. Not only that, we (the feds) are gearing up to enforce them, strictly but fairly.

Enough about legislation, let's look at INCENTIVES. Two levels of government in Canada are presently reviewing the incentives and disincentives that have impacts on waste reduction. Changes are being made to government purchasing standards and habits to promote the purchase of products containing recycled materials and the use of environmentally friendly products.

Governments can also use the following incentives:

- Tax credits

- Funding/grants

- Low interest loans.

In the tax credit category comes the Accelerated Capital Cost Allowance (ACCA) which allows the write off of the cost of capital equipment or processes installed for the prime purpose of preventing and controlling pollution over two years instead of the usual depreciation period.

In the funding/grants category the federal government has three main funding/grant programs that could be applied to waste reduction schemes. They are:

- Development and Demonstration of Resource and Energy Conservation Technology (DRECT)

  Pays up to 50% of the cost of developing and demonstrating prototype systems of new technologies that reduce pollution or save energy.

- Environmental Partners Fund

  Pays up to 50% of the total cost of a project to a maximum of $200K over three years. Mainly designed for individuals and non-profit organizations, but small business may apply.

- IRAP (Industrial Research Assistance Program)

  Grants to pay salaries of research staff (National Research Council administered).

Others

- On-Site Program

  Uses unemployment funds. Run by Energy Pathways Inc. for the Dept. of Employment and Immigration.

- $1 Surcharge added to wholesale price of pesticide containers. Money goes to recycling and research into how best to deal with empty containers.

  Government may also remove disincentives to recycling, e.g. tax on re-refined used oil.

In the COMMUNICATIONS/INFORMATION transfer field this seminar is one example where the federal government is trying to increase the awareness of Small Business to the benefits to be derived from waste minimization. Over the past two years we have put on a similar seminar in Edmonton, and a three day course on waste management for the metal plating industry.

Governments have lots of information, its yours for the asking. Contact your local federal government and provincial offices.

The federal government puts out a quarterly newsletter on waste topics, called "Resilog".

The Ontario Waste Management Corporation produces an excellent newsletter on Waste Minimization.

Read your Trade Magazines.

Go to conferences, workshops and training seminars.

Join your trade association.

If you can afford it, hire a consultant.

The money and effort you spend on acquiring information will be repaid several fold, provided that you use the information to DO something to reduce your wastes.

If you don't do this voluntarily government will be forced to make regulations that force you to do so. Its far easier and cheaper to do it voluntarily, believe me.

WASTE REDUCTION - THE PROVINCIAL PERSPECTIVE

BY

D. THOMPSON

MANITOBA ENVIRONMENT

OCTOBER 25, 1990

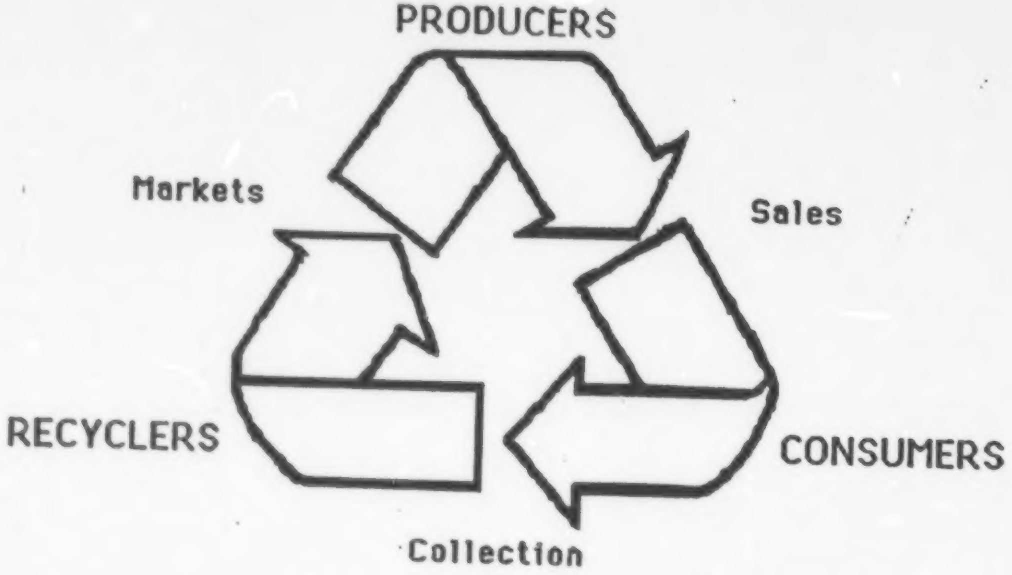
MANITOBA'S RECYCLING INITIATIVE

WHY SHOULD WE RECYCLE?

- Garbage doubles every 10 to 15 years
- Cost Municipalities $20.5 Million in 1987
- Environmental Impact of Disposal
- Wasting Resources
- Economic Opportunities

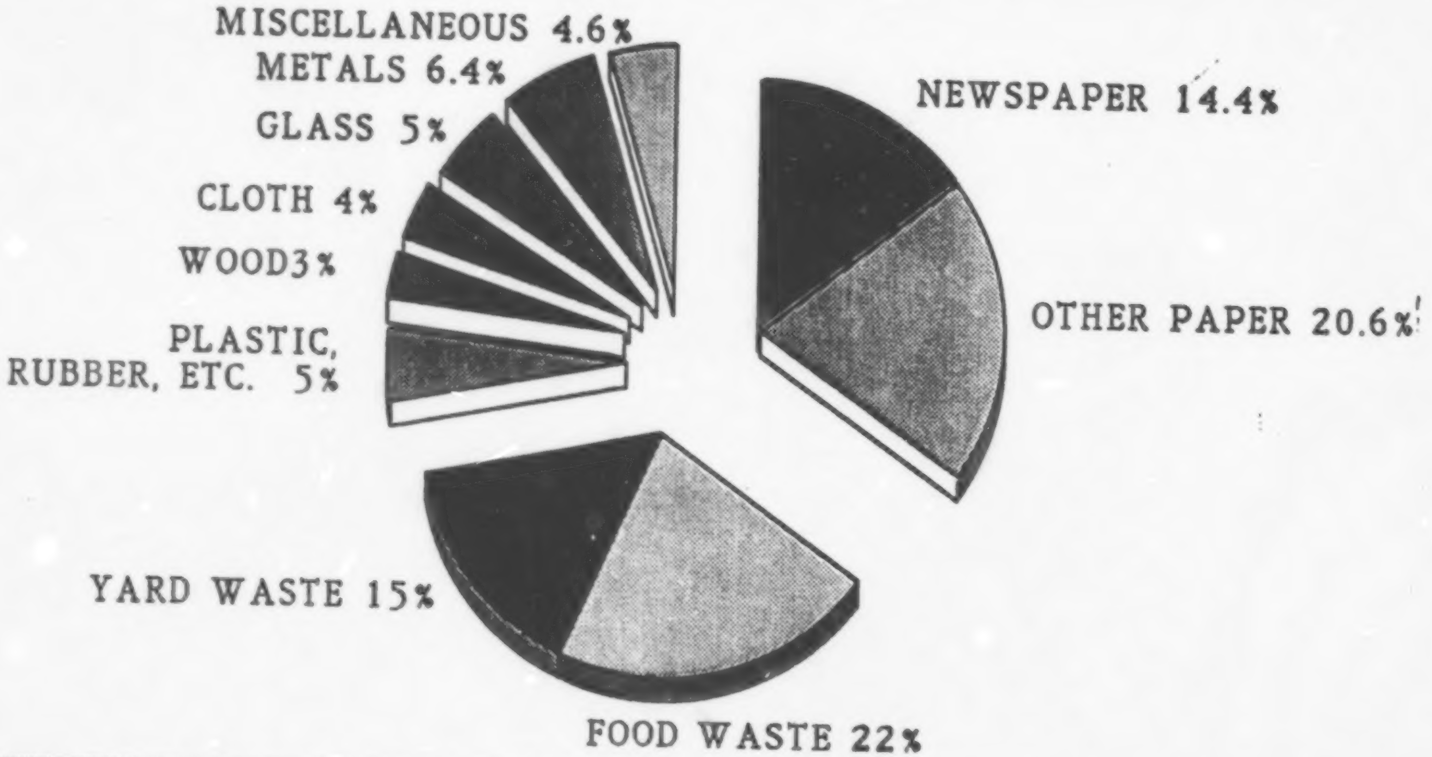
MANITOBA'S RECYCLING INITIATIVE

WHAT IS RECYCLING?


PRODUCERS
Sales
CONSUMERS
Collection
RECYCLERS
Markets

MANITOBA'S RECYCLING INITIATIVE

MUNICPAL SOLID WASTE — % by weight



MANITOBA'S RECYCLING INITIATIVE

WHAT IS EVEN BETTER THAN RECYCLING?

- REDUCE

  Use durable products, Repair Goods, Less packaging
- REUSE

  Returnable Containers, Diapers, Dishware
- RECYCLE

  Reprocessed - i.e. Aluminum, Paper, Glass
- RECLAIM

  Energy Recovery, Composting

MANITOBA'S RECYCLING INITIATIVE

MANITOBA'S
RECYCLING
INTITIATIVE

- GOAL -

REDUCE THE AMOUNT OF SOLID WASTE
BY 50% BY THE YEAR 2000

Phase 1: (1989 - 90) Development
Phase 2: (1990 - on) Implementation

MANITOBA'S RECYCLING INITIATIVE

Recycling Action Committee

- Established June 1989
- Advise Minister on how province should meet goal of 50% reduction in solid waste by 2000
- Stakeholder representation — fourteen members
  - — Chaired by Dr. Robert Fenton, University of Winnipeg
  - — Environmental Groups, Chamber of Commerce, Municipal, Consumers groups and Industry
- Public Consultations
  - — Town Hall Meetings (October-November 1989)
    - -12 public discussions (800 attended)
  - — Conserving Our Future Conference (March 1990) (450 attended)
- Report and Recommendations (May 1990)
  - — Action Plan: A Waste Minimization Strategy for Manitoba in the 1990's

MANITOBA'S RECYCLING INITIATIVE

Waste Reduction Targets — Categories

- Food and Beverage
- Chemical products
- Pharmaceuticals and Cosmetics
- Paper and Paper Products
- Automotive and Equipment Industries
- Appliances
- Other Consumer and Wholesale Containers
- Clothing and Other Semi-durables
- Construction and Building Materials
- Yard Wastes, Kitchen Wastes and Other Compostables

MANITOBA'S RECYCLING INITIATIVE

Priority Products and Materials

- Tires, Batteries and Lubricating Oils
- Old Newspapers
- Corrugated and Commercial Waste Paper
- Yard Waste
- Beverage Containers
- Disposable Diapers

MANITOBA'S RECYCLING INITIATIVE

Waste Reduction Targets — Criteria

- Proportion of material in the waste stream
- Toxicity
- Special landfill problems
- Public concern
- Ease of waste reduction
- Environmental intensity - energy use, material content, etc.

MANITOBA'S RECYCLING INITIATIVE

Waste Reduction Targets — Levels

Reduction levels for targets were identified as follows:

- High targets: 65 - 85%
- Medium targets: 45 - 65%
- Low targets: 25-45%

MANITOBA'S RECYCLING INITIATIVE

Market and System Development

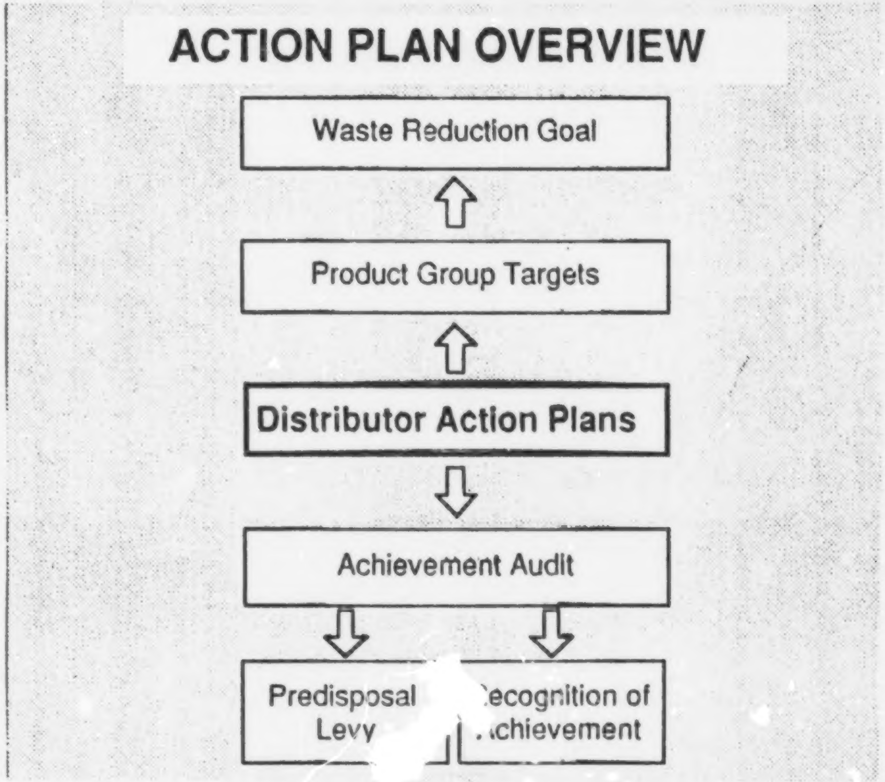
- "Build on what we have for what we need"
- Multi-stakeholder association to provide coordination for grassroots recycling and education activities
- "Closing the Loop"
  - Procurement Policy
  - Market Development
- Coordination
- Secondary Material R&D
- Consolidation of Waste Disposal Grounds
- Waste Minimization Trust Fund

Sustainable Development

- A "Waste Minimization Strategy of the 1990's should be based on the principle of Sustainable Development"
- "Humanity has the ability to make development sustainable — to ensure it meets the needs of the present without compromising the ability of future generations to meet their own needs" (Report of the World Commission on Environment)
- The 2nd World Conservation Strategy, Draft Report
  - Ecological Sustainability
  - Social Sustainability
  - Cultural Sustainability
  - Economic Sustainability

MANITOBA'S RECYCLING INITIATIVE

Action Plan Overview



ACTION PLAN OVERVIEW

Waste Reduction Goal

Product Group Targets

Distributor Action Plans

Achievement Audit

Predisposal Levy

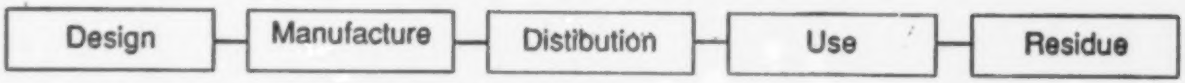
Recognition of Achievement

Distribution Chain

- Distribution Chain is responsible for waste minimization of a product sold within the province
- Government is responsible for park and household yard waste normally sent to the landfill
- Each distribution chain to achieve a specific waste reduction target to contribute to the overall goal
- Waste minimization targets to be negotiated between stakeholders and government

The Distribution Chain

The Distribution Chain


Design
Manufacture
Distibution
Use
Residue

MANITOBA'S RECYCLING INITIATIVE

The Strategy

- Manitoba Environment to prepare a list of priority products (January 1991)
- Distributors of selected products to develop Action Plans to minimize waste from products
- Distributor Action Plans — content flexible, combination of 4-Rs, national protocol considerations, etc.
- Incentives — Distinctive recognition (public awareness, honour roll, logo)
- Penalties — Products and firms not achieving interim targets or milestones assessed a predisposal levy

MANITOBA'S RECYCLING INITIATIVE

GOVERNMENT PROCUREMENT POLICY

- "The government will purchase recycled and environmentally sensitive products where practical and effective, while taking environmental considerations into account in its internal operating and disposal decisions."

MANITOBA'S RECYCLING INITIATIVE

Education

- Community Outreach (Provincial Recycling Outreach Workers)
- School-based approach
- Development of technical skills

NON-HAZARDOUS HIGH PERFORMANCE PAINTING SYSTEMS

BY

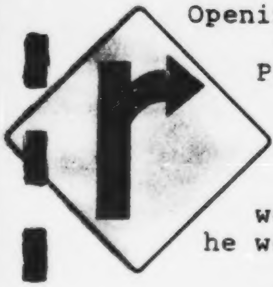
WAYNE SENICK

RODE MANAGEMENT SYSTEMS INC.

OCTOBER 25, 1990

rode management systems
Unit B - 740 Century Street, Winnipeg, Manitoba R3H 0M1
Telephone (204) 786-4966 Fax (204) 786-2065

Presentation at Industrial
Waste Reduction Seminar Oct. 25/90



Opening Remark - Fly story

- Leland Yarbrow, a user of our Flexi-gloss Industrial Polyurethane, had a complaint about our product. With the old free isocyanate two-part polyurethanes he used to apply, if a fly flew into the booth it was either killed by the fumes or died as soon as it came in contact with the surface; but with Flexi-gloss, it would just skate around all over the paint job and then he would have to try and kill it.

As Environmental Managers, a rider must be added to your job descriptions, that is the title of Efficiency Experts.

As Efficiency Experts here are someways you can refine your approach to handling coatings within your organizations.

- Gross cost of paint (water base)
- Net cost of paint (solvent based)

When a paint salesman quotes you on the cost of a litre of paint, you cannot look at only the net cost; you must also look at the costs down the line like handling, application, and disposing of the waste generated from the process.

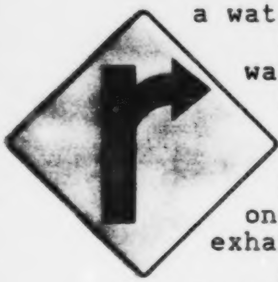
With a solvent based paint your down line costs are:

1. Cost of disposing of solvent - anywhere from four to eight hundred dollars per drum.
2. Heating the air which goes into the paint booth and then exhausting it outside is a great cost in winter.
3. Higher insurance rates for having hazardous and highly flammable solvent on your premises.
4. Possible increased workplace absenteeism as a result of solvent sickness and problems which evolve from solvent addiction, such as alcoholism. (Explanation - A Stanford University study found that the rate of alcoholism among painters and people who work with solvents all day was 25% higher than the general population. These people would use alcohol to stave off the depression which would come on as they came off the effect of the solvent.)
5. A higher level of government intervention and regulations which must be complied with when using hazardous materials.
6. A poorer corporate image when viewed as an environmental polluter resulting from the use and disposal of hazardous materials and wastes.

All of the above mentioned costs **must** be added to the cost of the solvent based paint to give you your true gross costs.

By using a non-hazardous water based coating or a coating with a non-hazardous solvent level (ie. 100% solid coating (powder coating)) or a product cut with a nonaromatic solvent (ie. a #8 or less mineral spirit) your gross cost is very close to the initial cost of the paint.

For example: Our Flexi-gloss Industrial Polyurethane is a water borne isocyante-free high performance coating.



1. Solvent disposal - waste is classified as a Class B waste. The solids can be drummed and disposed of in a landfill site, and the water poured off and re-used, or it can be disposed into the sewer system as there is no toxic chemical residue.

2. Heating costs - the exhaust from the paint booth, once it passes through particulate filters, can be exhausted back into the plant thus saving on heating costs.

3. Insurance rates - a reduction of insurance premiums can be realized due to less fire hazard and less risk to employees. Plus you do not require a special block house for paint storage.

4. Safety in the work place, no danger of solvent addiction or sickness, plus reduced liability in the future from health problems which could result from the use and contact with these hazardous solvents.

Example: New Breed of Lawyer in California - Environmental Health Lawyer.

Cases are now appearing in the courts of California where employers are being sued by former employees with health problems which they allege are a result of their exposure to hazardous solvents and products in the work place. This could be a very costly long term liability if a presidence is established.

5. Government intervention would be minimized as you would not be a pollution risk.

6. You could advertise your product as manufactured with non-hazardous products without compromising quality.

When we quote a price on the above mentioned product, it truly is a gross cost. It may even have a net saving to the company, depending on your production process. It will definitely be a positive cash flow producer in the reduction of long term liability.

Painting costs and the hazardous level of the coating are governed by the level of solid material and the V.O.C.'s (Volatile organic compounds or solvents) in the coating.

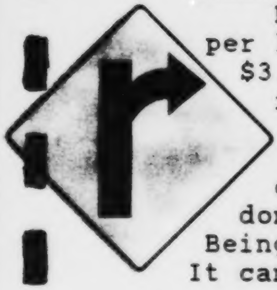
When buying paint you need to know the percent volume solids in the coating. The solid material is what stays on the surface, the remainder evaporates into the air.

For Example: 1 litre of material at 100% volume solids and 100% transfer efficiency will cover 424 sq. feet.

Paint A: 1 litre of material at 15% volume solids and 100% transfer efficiency will cover 63.6 sq. feet.

Paint B: 1 litre of material at 40% volume solids and 100% transfer efficiency will cover 169.7 sq. feet.

If Paint A costs $20.00/litre and Paint B costs $60.00/litre which would be the better environmental buy? Remember you are buying one litre.



Paint B would be your better buy. It has a higher cost per litre but your cost per sq. foot is $2.83 as opposed to $3.20 with Paint A and you would exhaust 25% less V.O.C. into the environment.

As a consumer of paint, that $9.95 gallon of house paint may not be the best deal. Remember water is cheap, % volume solids is what you need to know and don't be fooled by weight, water weighs 10 pounds/gallon. Being environmentally conscious doesn't have to be a burden. It can be profitable and a learning experience.

Thank you.

Summary - Photocopied Articles

Article # 1

- Defines what the S.D.A.Q.M.D. is. I used the article to establish what I defined as a non-hazardous paint by using the S.D.A.Q.M.D. standard for V.O.C. for 1996 which is 2.3 lbs/gallon U.S.

This article also gives examples of what happens with companies when a competitor introduces an environmentally friendly product and how quickly the others can bring it on line when pressed.

It also has a side bar on environmental snitches which is kind of interesting.

Article # 2

- This is another illustration of how the paint companies involved in the auto body business said that they couldn't come up with a compliant waterbased primer by the date specified in the regulation but lo and behold when the day rolled around and the regulation wasn't repealed they all introduced compliant products.

Article # 3

- This article gives a magnitude of scale on the level of pollution which paint and solvent vapors produce. It illustrates a 3 tier proposal for the reduction of the pollution.

Also, it illustrates the level of fines which are being leveled upon violators

Article # 4

- This article gives an example of how other countries are dealing with V.O.C. in the furniture industry and also spells out the new regulations for V.O.C. lbs/gallon to take effect in 1996.

Article # 5

- This article defines what a polyurethane is and what is toxic about currently available 2 part solvent based products.

It also is a reference re: current technology and also gives an overview of the performance and structure of water borne polyurethanes available on the market. With Flexi-gloss, we have overcome the water permeability problem and use a new cross linking agent which allows us to far exceed the performance of solvent based 2 part products. Information from this article can be used to illustrate this.

Article # 6

- This is another article illustrating what is going on in the coating industry to meet the new environment rules.

Article # 7

- This article illustrates some of the effects that the new environmental rules are having on business and how things can get convoluted when people don't have all the facts.

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SIMPLE TECHNIQUES FOR WASTE REDUCTION

BY

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SIMPLE TECHNIQUES FOR WASTE REDUCTION

Roy Nixon

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Waste minimization can be both expensive and complicated to implement, but it need not be. Significant reductions can be achieved easily and inexpensively. You merely have to do some thinking about your operations, some observation of how your operations run, use your common sense, and then do something.

Techniques for waste reduction basically fall within the following areas:

- careful purchasing of raw materials
- care in the storage and handling of raw materials
- training employees
- elimination of leaks and spills
- substitution of non-hazardous or less hazardous for hazardous materials
- process changes
- good housekeeping
- preventive maintenance

Of the above, only two might require capital expenditures, namely process changes and elimination of leaks and spills, but even these need not be expensive.

For some of the above areas the actions required are obvious, the rest are probably best described by giving examples.

Purchasing

The manager of the Swan Hills Waste Treatment Facility in Alberta says that as much as 10% of the waste that is received is un-used raw materials. Unopened containers, seals intact. The companies that are disposing of these materials incurred quadruple costs. First the cost of the purchase, second the cost of storage and handling, third the cost of the money used for the purchase, and fourth the cost of disposal.

The lesson is obvious, "Don't buy more than you can use".

Storage and Handling

The manager of the Swan Hills facility also says that they also receive a lot of wastes that result from improper storage of raw materials and finished products. The main reasons being water damage, frozen liquids, torn bags, leaking containers, and heat damage.

Again the lesson is obvious. "Pay attention to your storage".

Elimination of Leaks and Spills

The fixing of leaking flanges, valves, faucets, etc. is usually a simple, inexpensive action. You could also choose to regard this type of technique under the headings "Good Housekeeping" or "Preventive Maintenance". Some spills can probably be prevented by simple changes in operations or training of employees, others that are chronic in nature may require some capital expenditure. For example, I used to work for a large chemical company that, among other things, produced a water soluble, organic compound that was a granular powder. This solid was transported from the reactor to the dryer and storage bins by a form of bucket elevator. There was chronic spillage, minor but constant. As the product was water soluble this spillage was washed down the floor drain with a hose. A little observation of the operations and the application of some elementary process engineering led to the elimination of the bucket elevator and the substitution of an unexpensive pneumatic system for moving the product. Production increased by nearly 10%. To achieve this kind of increase by enlarging equipment and processing more raw materials would have cost over a 100 times what it costs to install the pneumatic system. Not only that, there were other benefits such as a reduction of dust in the work place, a dryer workplace, and a cleaner plant effluent - less treatment costs.

The following examples arise out of the work that Environment Canada has been doing over the past four years or so, to encourage waste reduction by small businesses. Thus far we have carried out plant assessments and produced reports on waste reduction opportunities in the metal finishing industry and the paint formulation industry. At the present time we are taking a look at small foundries.

Simple Process Changes - Metal Finishing

Most of the waste generated in metal finishing or plating operations are associated with "drag out", i.e. the plating solution dragged out of the plating tank when the object being plated is removed. This "drag out" is removed from the plated object, and holding racks and barrels, by rinsing. Unless something is done to capture this dragged out material and return it to the plating bath, it will end up going down the sewer in the rinse water.

- A simple way of reducing "drag out" is to hold the piece pulled from the plating bath directly over the bath for sufficient time to allow most of "drag out" to drain off. A little detergent added to the plating solution will speed up the draining time.

- Install a simple drip board between the planting tank and the first rinse tank or drag out tank. Slope the drain board back toward the plating tank.

- Install a drag out tank between the plating bath and the first running rinse tank. The drag out tank is merely a still rinse tank (no input, no output). Eventually the drag out tank will become concentrated enough to be returned to the plating bath to make up losses.

- Rinsing efficiency (less water usage) can be improved by employing a series of counter current rinsing tanks and agitating the rinse by means of turbulence created by blowing air into the tanks via a perforated pipe. Another source of waste in the plating process is the cleaning step. The piece to be plated is usually first cleaned in an alkali bath to remove dirt and grease. It is then rinsed (alkali rinse) and put into an electro-clean bath, rinsed again, then put into an acid bath, then rinsed (acid rinse) again. By recycling the acid rinse back to the alkali rinse two things can be accomplished:

1. Pollution from the alkali and acid rinse effluents can be reduced or eliminated.
2. The life of the alkali rinse solution can be extended by neutralizing with the acid rinse.

Non-Hazardous or Less Hazardous Chemical Substitution - Metal Finishing

1. Substitute Cr^{3+} for Cr^{6+}. Cr^{3+} is far less toxic to aquatic life than Cr^{6+}.
2. Eliminate cyanide by plating nickel directly onto steel, zinc, or brass instead of first putting on a copper strike.
3. Use a tin strike instead of cadmium (to improve solderability). Tin is far less toxic to the environment than cadmium.

The above examples represent only a small portion of the techniques available to reduce waste in the metal plating industry. If you want to know more, ask and we will send you copies of reports on the subject.

Simple for Techniques Waste Reduction in the Paint Formulating Industry

The opportunities for waste reduction in this industry are only a fraction of those available to the metal plating industry. However, the ones that are available are very easy to put into effect.

Paint formulating is usually carried out by a batch process. Typically a small manufacturer will produce 500 gal. batches, and a large manufacturer about 6000 gals per batch.

The manufacturing process is relatively simple, consisting of two basic operations - blending and filling.

Blending includes the mixing and dispersion of pigments, and thinning.

Filling (of cans, drums or aerosol cans) can be manual or automated operation.

There are usually six (6) basic sources of wastes:

- raw materials packaging (bags, drums, wrappers, etc.)
- waste raw materials and finished products
- cleaning operations (solvents, water caustic, sludge)
- solvent air emissions
- cooling water (from ball mills) - may contain $Na_2\ CrO_4$
- filters (product and dust)

Waste from these can be reduced by applying some very simple techniques.

1. Good Housekeeping

    a) Store raw materials and products properly - clean, dry, correct temperatures.

b) Adopt a FIFO inventory system for both raw materials and products (FIFO - first in, first out).
c) Handle raw materials and products carefully.

2. Operational Changes and Process Modifications

a) Scrape as much paint from process vessels before solvent cleaning.
b) Avoid allowing paint to dry in process vessels.
c) Use high pressure spray cleaning
d) Avoid unnecessary cleaning, e.g. dedicate equipment to one formulation.
e) Schedule product production in sequence light to dark colours.
f) Use same solvent for cleaning as used for thinning. It can then be used for thinning the next batch of the same product.
g) Dry clean spills.
h) Use bag or wire screen filters instead of disposable cartridge type.
i) Use slurried instead of powdered pigments.
j) Re-use pigments recovered from air filters.
k) Segregate wastes, e.g. solvent based, water based.
l) Improve production scheduling to avoid unnecessary transfers and storage.

3. Materials Substitution

Questions to be asked/answered:

- can a less toxic/hazardous solvent be used?
- can a less hazardous (environmentally) pigment be used? e.g. a zinc based yellow instead of a cadmium based yellow.

4. Waste Re-Use/Recycle

a) Rework solvent waste into new products.
b) Rework off-spec product or returned product.
c) Rework residues into product.
d) Recycle waste paper and cardboard.
e) Return undamaged drums to the supplier.
f) Use a closed system for cooling water
g) Recover solvent, either on-site using a still, or by off-site custom redistiller.

5. Waste Exchange

- to get rid of your own waste
- to acquire someone else's waste that can be used, e.g. printed circuit board and microchip manufacturers must use ultra-pure solvents for cleaning. They are used once, but are still pure enough to meet most other industry requirements.

There is nothing in the examples given above that requires either sophisticated technical knowledge or, large amounts of capital.

All that is necessary to achieve substantial reductions in waste is for you to examine your operations with a critical eye.

"You can't afford the time". "You're too busy trying to make a buck"!

You cannot afford not to! A dollar saved is worth multiple dollars in sales.

Sources of Help

1. Waste Exchange - there is one in Manitoba, the number is in the Winnipeg telephone book.

2. Get on the mailing list for "Resilog", Environment Canada's waste newsletter. Call Paul Topping at (819) 953-1139.

3. Get on the mailing list to receive the Ontario Waste Management Corporation's Waste Reduction Bulletin. Call John Richmond, toll free: 1-800-268-1179 or 416-923-2918 or write to O.W.M.C., 11th Floor, 2 Bloor St. West, Toronto, Ontario M4W 3E2.

4. The O.W.M.C. also sells a guide on how to conduct a waste audit plus some examples of waste reduction studies. The title is: Industrial Waste Audit and Reduction Manual. Present cost: $40.

5. The Pollution Probe Foundation publishes a book titled "Profit from Pollution Prevention". Cost of the new edition will be about $40-50.
   Address: Pollution Probe
   12 Madison Ave.
   Toronto, Ontario
   M5R 2S1

6. Get a copy of the annual U.S. EPA publication, "Pollution Prevention Training Opportunities for 199?"

   Its free for the asking and contains a mine of information on where to get fact sheets, written training materials, videos for sale or rent, how to access their computer information systems, etc. etc.

   The address is: U.S. Environmental Protection Agency
   Office of Policy, Planning and Evaluation
   401 "M" Street S.W. (PM-219)
   Washington, D.C.
   20460

7. Don't forget your provincial Environment department. It has a Waste Management Branch or Section. The people who staff it are there to serve you. They are experts in the field. Give them a call, they will either be able to answer your questions directly or steer you to someone who can.

8. The same applies to Environment Canada. There are offices in Edmonton, Regina, Winnipeg and Yellowknife that employ staff knowledgeable about wastes and waste reduction.

If you apply even a small amount of the information you have received today you will be rewarded by reduced cost, reduced liabilities (both short and long term), maybe with better products, and certainly less hassle from government regulators.

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